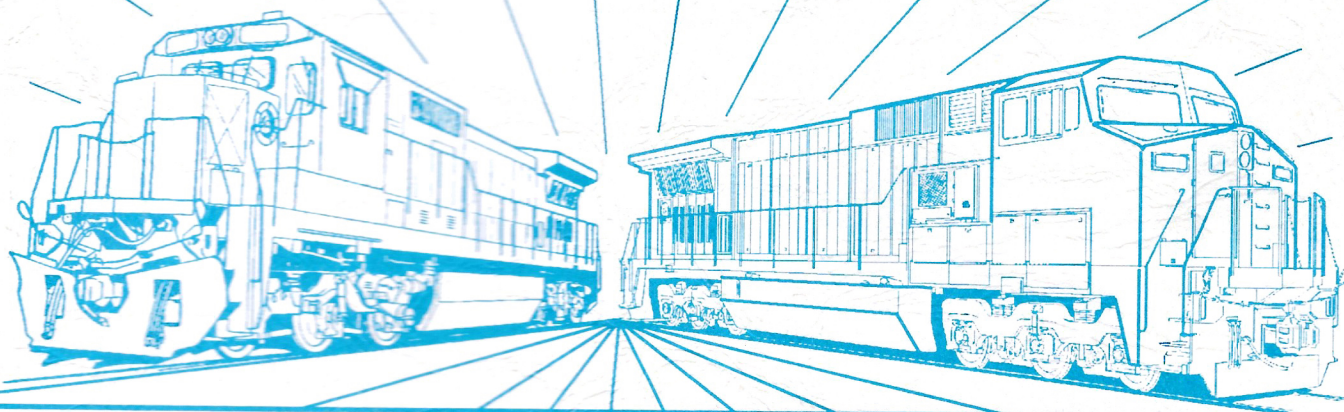




GEJ-6736

# ***DASH 8 IFC Locomotive***

## **INTEGRATED FUNCTION CONTROL**



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# **Operating Manual**







## **OPERATING MANUAL**

# **DASH 8-40CW DIESEL-ELECTRIC LOCOMOTIVES**

## **WITH INTEGRATED FUNCTION CONTROL**

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## FOREWORD

WELCOME to the GE DASH 8-40CW Locomotive, one of the finest locomotives the world has known. The Wide Cab concept has been developed to give the operating crew more comfort and to localize most of the control operation in front of the engineer at the control stand and overhead console. This locomotive is equipped with the new "Desktop Controller" and the next generation in locomotive control: the Integrated Function Control (IFC) – a concept developed to localize most of the control operation in front of the engineer at the control stand. As the name implies, this is an integrated control system enabling the crew to have the important operating parameters at their finger tips. This concept will be explained further in the INTRODUCTION section of this manual.

This Operating Manual is arranged in sections: SUMMARY OF WARNINGS AND CAUTIONS, INTRODUCTION, DATA, OPERATING CONTROLS, DIAGNOSTIC DISPLAY PANEL (DID), AIR BRAKE EQUIPMENT, OTHER EQUIPMENT, ALARMS/SAFEGUARDS, OPERATION and a grouping of the various functions available (e.g.: End of Train; Power Reduction; Screen Menu) on these units equipped with Integrated Function Control. Locate these needed sections easily by using the following CONTENTS Section.

The SUMMARY OF WARNINGS AND CAUTIONS section lists (in one place) certain safety-related conditions which require specific action. They are repeated in the text where needed. **Please read this section now, before proceeding to other sections of this Manual.**

The INTRODUCTION section describes and gives a basic overview of the IFC system while the OPERATING CONTROLS Section identifies the associated hardware located in the operating cab. A brief description of the equipment is also included. The DATA Section, along with Fig. 2 (*Location Of Apparatus*), gives a general overview of the locomotive.

The DID section explains how to use this panel which is a fast and accurate means of communications between the locomotive engineer and the computers. Several examples are included to demonstrate the DID operation. A valuable resource (LIST OF SUMMARY MESSAGES) is included at the end of this section. For further details and a complete list of fault messages, refer to the Locomotive RUNNING MAINTENANCE manual.

The AIR BRAKE EQUIPMENT Section lists and explains some of the principal parts of the system which might interest the operator. For further details, refer to the Locomotive RUNNING MAINTENANCE and BACKSHOP manuals.

The OTHER EQUIPMENT Section lists and explains control equipment found in Control Areas (See Fig. 2) 1, 2, 3, 4, 6, 7, 8 and 9. Also included in this section are Figures and text explaining the Engine Start Station, the Engine Control Governor, Water System Draining and important Gages of which the operator should be aware. For further details, refer to the Locomotive RUNNING MAINTENANCE and BACKSHOP manuals.

The ALARMS Section lists, describes and illustrates the various Alarms, Safeguards, Power Derations and Shutdown Situations an operator may encounter. The sections on Overspeed and Wheel slip will be of great interest.

The OPERATING PROCEDURES section gives step-by-step instructions for locomotive operation as well as listing various functions available for use. The sections on Dynamic Braking and use of Air Brakes during Dynamic Braking will be of great interest. This section is included last in the manual for operator convenience along with a grouping of the various control functions (Power Reduction, End of Train, etc.) included on this locomotive.

This wide-cab design with the IFC concept supplied on locomotives shipped since early 1993 is the next step in General Electric Transportation Systems program to enable a complete, integrated, computer control of the locomotive. Future enhancements will be developed and added as technology provides. **Comments are appreciated.** Please send any comments to your local GE representative or mail to:

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■ Revisions are indicated by marginal bars.

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## SUMMARY OF WARNINGS AND CAUTIONS

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The following is a summary of safety precautions which must be observed when operating this General Electric Locomotive. WARNINGS indicate the potential for danger to personnel, and CAUTIONS indicate the potential for damage to the equipment. The Manual Section where the precaution is located is listed at the lower right-hand of the precaution. The precautions are repeated where applicable throughout the manual.

**THESE INSTRUCTIONS DO NOT COVER ALL DETAILS OR VARIATIONS IN EQUIPMENT NOR PROVIDE FOR EVERY POSSIBLE CONTINGENCY TO BE MET IN CONNECTION WITH INSTALLATION, OPERATION, OR MAINTENANCE. SHOULD FURTHER INFORMATION BE DESIRED OR SHOULD PARTICULAR PROBLEMS ARISE WHICH ARE NOT COVERED SUFFICIENTLY FOR THE USER'S PURPOSES, THE MATTER SHOULD BE REFERRED TO GENERAL ELECTRIC COMPANY. ANY APPLICABLE FEDERAL, STATE OR LOCAL REGULATIONS OR COMPANY SAFETY OR OPERATING RULES MUST TAKE PRECEDENCE OVER ANY INSTRUCTIONS GIVEN IN THIS MATERIAL. PLEASE MAKE A NOTE OF ANY OF THESE RULES IN THE SPACE PROVIDED. GE HAS NO OBLIGATION TO KEEP THESE INSTRUCTIONS UP TO DATE AFTER THE ORIGINAL PUBLICATION. THERE ARE NO WARRANTIES OF ACCURACY, MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE.**

### WARNINGS:

*Finding the Combined Power handle away from IDLE with the Reverse handle removed indicates that interlocking between handles requires repair or adjustment. Do not attempt to operate unit until condition has been repaired.*

OPERATING CONTROLS

*To ensure safe consist operation, follow specific Railroad precautions for securing Trail or Dead units.*

OPERATING CONTROLS, AIR BRAKE EQUIPMENT

*High voltage is present in the Control Equipment compartment (Control Areas 2, 3 and 4) when locomotive is under load. When the door to this compartment is opened, the Door Interlock Switch (DIS) will trip causing the unit to drop power. As a safety precaution, before entering this compartment, open the Auxiliary Alternator Cut-Out switch (BFCO) located inside Control Area 1.*

OTHER EQUIPMENT

*To avoid personal harm from water burns, when the water level is above FULL AT IDLE mark, NEVER remove the water fill cap. If over-full, open manual drain valve to reduce the water to a safe level.*

OTHER EQUIPMENT

*While servicing the air compressor, open Local Control Circuit Breaker (LCCB, Item 16, Fig. 9) to prevent air compressor motor from starting.*

OPERATING PROCEDURES



## CAUTIONS:

*It is recommended that the traction motor cut-out switches be operated only with the Engine Control switch in START or ISOLATE position so the unit is isolated and the Combined Power handle in IDLE. Dynamic Brake operation could be affected.*

OPERATING CONTROLS, ALARMS

*Equipment damage may result – If a FAULT reoccurs soon after being reset, the operator should NOT attempt to reset the FAULT more than THREE TIMES until the cause of the FAULT has been determined and corrected.*

DIAGNOSTIC DISPLAY PANEL

*To prevent serious equipment damage, NEVER start an engine until the governor has been properly serviced with lube oil.*

OTHER EQUIPMENT

*During freezing weather, protect the engine cooling system according to railroad instructions.*

ALARMS

*Do not discharge the battery excessively by repeated attempts to start. If the first two or three tries are unsuccessful, recheck the starting procedure.*

OPERATING PROCEDURES

*The control system of this locomotive will delay movement from power to dynamic braking. If however, other locomotives in the consist do not have this feature, to prevent equipment damage when changing from power to dynamic braking or from dynamic braking to power, pause 10 seconds with the Combined Power handle at IDLE.*

OPERATING PROCEDURES

*After a locomotive has operated under full load for a considerable period of time, allow the engine(s) to run at IDLE for at least five minutes before shutting down. Otherwise, immediate shutdown after such operation could be harmful to some engine components requiring brief idling time to allow for cool-down.*

OPERATING PROCEDURES

*When Dead Heading (Dead-in-Train), to avoid wheel flats, drain main reservoir of unit 40 psi (276 kPa) below the brake pressure used on the train to which the locomotive will be coupled.*

OPERATING PROCEDURES

## INTRODUCTION TO INTEGRATED FUNCTION CONTROL

### GENERAL INFORMATION

The Integrated Function Control system (Fig. 1) is divided into two major parts: the Integrated Function Computer (IFC) and the Integrated Function Displays (IFD). The goals of this new control integration system are:

1. Provide the operator with more useful functional interfaces than many different operating schemes and controls.
2. Reduce clutter in the operating cab through the elimination of bolt-on boxes and redundant displays.
3. Improve equipment reliability through reduction of parts and connections.

### IFC

The IFC is the communications center for all on-board locomotive control functions. The basic IFC function is to distribute data among the various on-board locomotive control functions such as:

1. Slow Speed and Alerter control [and Audio/Visual Alarm Box (AVB)] systems located in the IFC system.
2. CAB, EXC and AUX controllers.
3. Diagnostic Display (DID) Panel mounted on the Engine Control (EC) Panel.\*
4. IFDs mounted on the control stand and Crew Member's desk.
5. Event Recorder – consisting of two parts: Permanent Core Memory (PCM) and Customized Recording Device (CRD) – data may be downloaded to a removable memory card.
6. End of Train (EOT) information through the Receiver Logic Unit (RLU).
7. Cab Signal (CSE) and Locomotive Speed Limiter (LSL) systems.
8. Electronic Air Brake Control System.\*

### IFD

The new Integrated Function Control System utilizes three highly-reliable IFDs (two located on the control stand; one on the Crew Member's desk) which are fed information over a data link from the IFC and feed operator commands to the IFC. Each IFD is a ten-inch diagonal, backlit, color graphics liquid crystal display (LCD). Background color is operator selectable by selecting "normal" or "inverse" video (refer to SCREEN MENU section of this publication for instructions). Screen colors have been chosen to attract the operator's attention: YELLOW for warning; RED for danger; BLUE and GREEN for gages. Screen brightness will dim or brighten automatically based on ambient light unless the SCREEN BRIGHTNESS button (see Fig. 50) has been used to bring the screen to full brightness (this will disable the automatic brightening function). Brightness may also be controlled manually to adjust for day, night or tunnel operation. The display also contains up to eight menu soft keys arranged horizontally below the screen. **Key position F8 is always EXIT (no matter what screen is displayed).**

Each IFD may independently display either the Function Screen or the Gage Screen.

**NOTE: Each of the IFDs (Gage Display, Function Display and Crew Member's Display) has its own independent bi-directional distance counter.**

### Operator's Gage Screen

This screen (Fig. 5) replaces the former analog speedometer, ammeter, air and pressure gages mounted on the control console. The screen will show both analog and digital readouts of Speed, Load and air pressure data. The air

\* Option



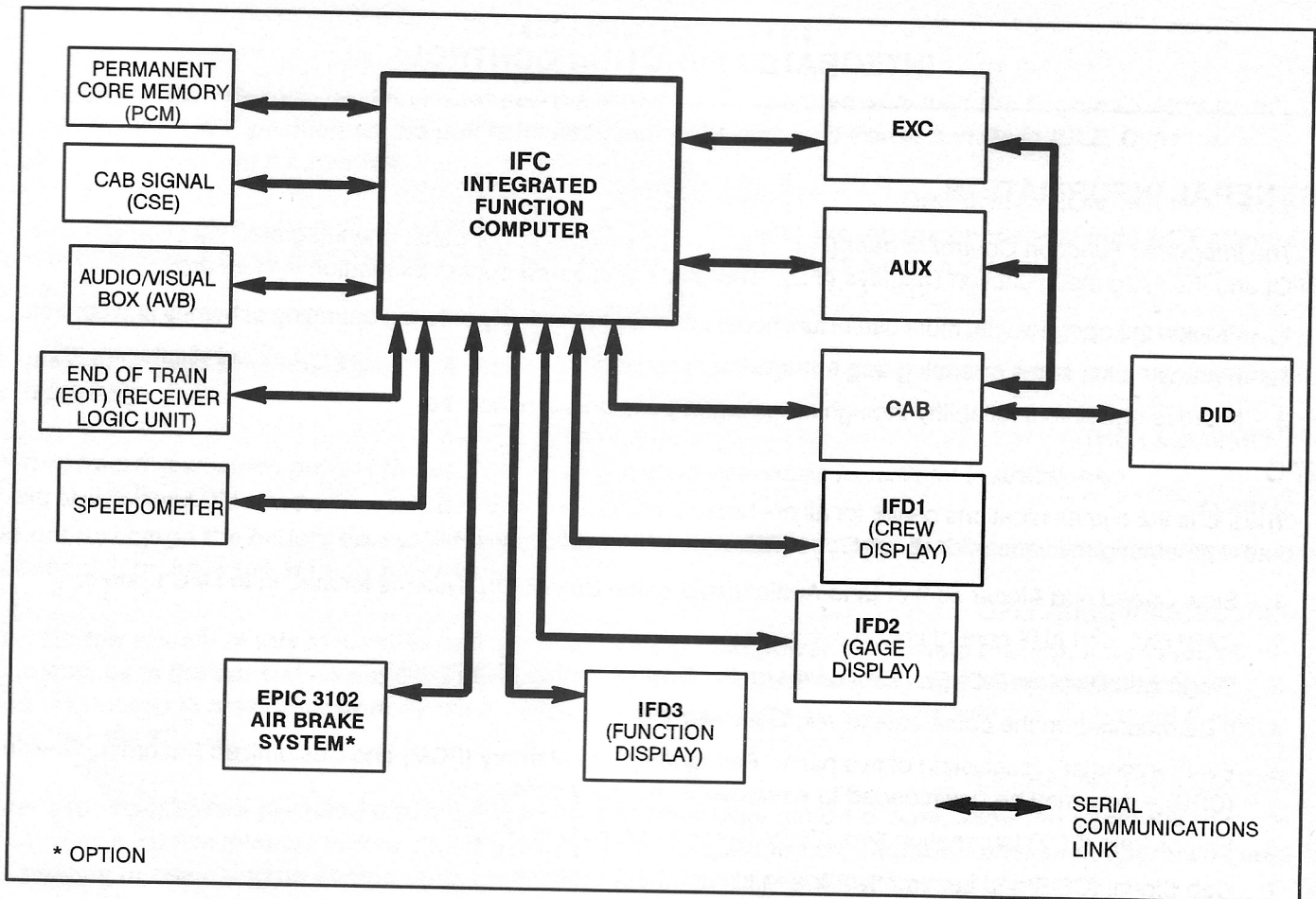


FIG. 1. INTEGRATED FUNCTION CONTROL SYSTEM OVERVIEW. E-40972.

pressure data covers Main Reservoir, Equalizing Reservoir, Brake Pipe, Brake Cylinder, End of Train and Brake-pipe Air Flow.

### Operator's Function Screen (Combined Screen)

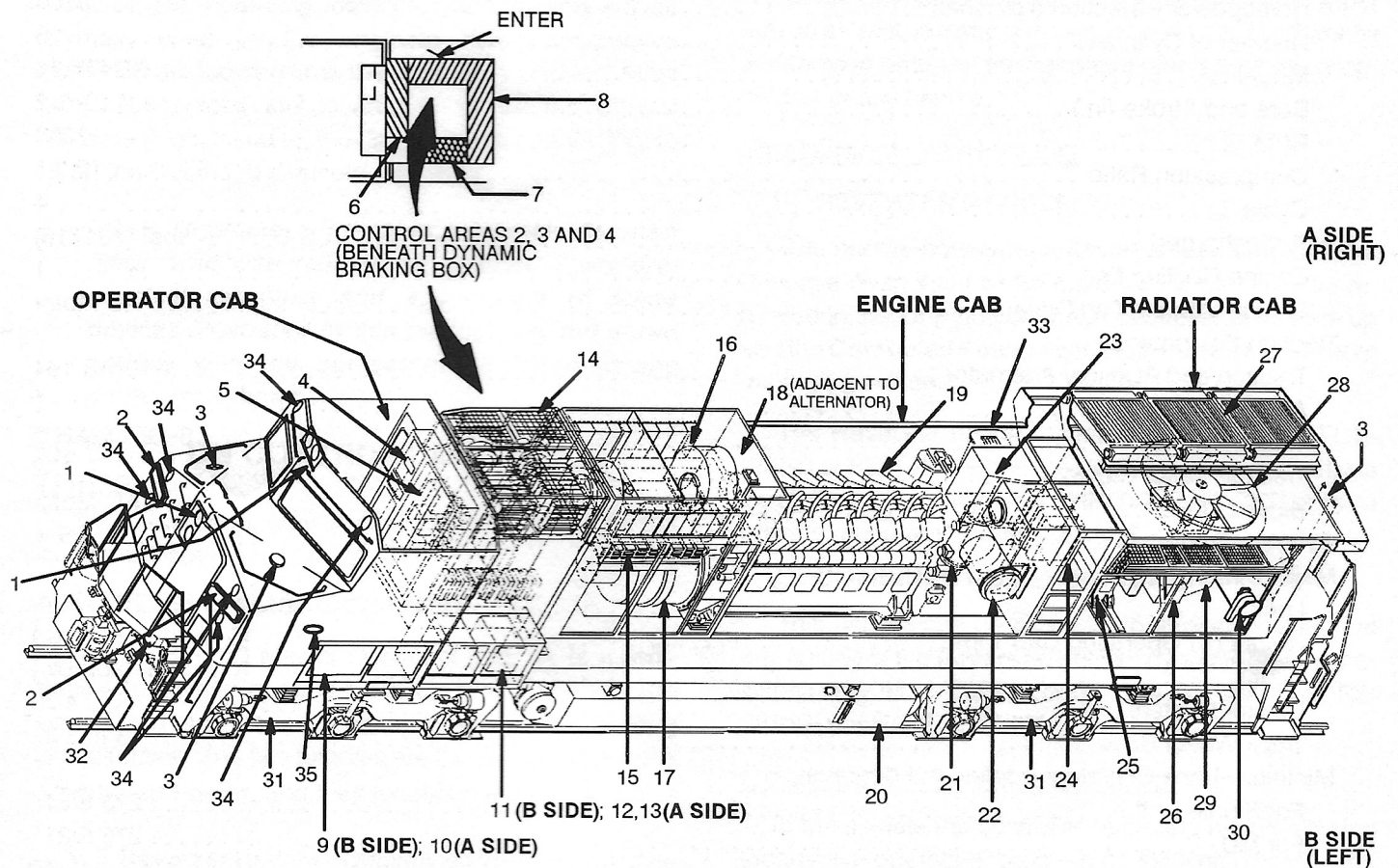
This screen (Fig. 6) replaces functional controls and displays of the bolt-on boxes covering Pacesetter, Hump Control, End of Train and Alarmer systems. Also included is a compressed version (all gage information is in digital form only) of the Operator's Gage display.

This screen also displays the annunciator lights for WHEELSLIP, PCS OPEN, DYNAMIC BRAKE and SAND also formerly mounted on the control console.

### Crew Member's Display

This IFD is mounted on the Crew Member's desk. It is used to monitor locomotive performance, see Operating Controls Section of this publication. **Note: No control operations are available at this unit.**

## DATA



REF	DESCRIPTION	REF	DESCRIPTION
1	HEADLIGHT (LOCATION CUSTOMER OPTION)	18	ENGINE START STATION
2	NUMBER LIGHT BOXES	19	ENGINE: 7FDL16, 16 CYL.
3	SANDFILL	20	FUEL TANK
4	ENGINE CONTROL PANEL	21	LUBE-OIL COOLER
5	CONTROL AREA #1	22	LUBE-OIL FILTER
6	CONTROL AREA #2	23	ENGINE WATER TANK AND WATER CONTROL VALVE
7	CONTROL AREA #3	24	ENGINE AIR FILTER COMPARTMENT
8	CONTROL AREA #4	25	AIR COMPRESSOR (MOTOR DRIVEN)
9	CONTROL AREA #6	26	CONTROL AREA #9
10	AIR BRAKE COMPARTMENT	27	RADIATORS
11	CONTROL AREA #7	28	RADIATOR FAN
12	CONTROL AREA #8	29	BLOWER AND AIR FILTERS (NO. 2 END)
13	BATTERY BOX	30	HANDBRAKE
14	DYNAMIC BRAKING BOX	31	TRUCKS: "C"-3 AXLES PER TRUCK
15	RECTIFIERS (PROPULSION)	32	DITCH LIGHTS
16	BLOWER BOX AND AIR FILTERS	33	ENGINE MUFFLER
17	ALTERNATOR (MAIN AND AUXILIARY)	34	MARKER LIGHTS (IF EQUIPPED)
		35	LOCOMOTIVE SPEED LIMITER INDICATING LIGHT

FIG. 2. LOCATION OF APPARATUS. E-40973.

**DASH 8-40CW**

Operating Cab and Controls .....	General Purpose
Wheel Arrangement .....	C-C
Engine Data:	
Horsepower – Traction (Nominal) .....	4100
Number of Cylinders .....	16
Model .....	GE FDL16
Bore and Stroke (in.) .....	9 X 10-1/2
RPM .....	1050
Compression Ratio .....	12.7:1
Cycle .....	4
Turbocharged .....	Yes (7S1716)
Engine Cooling Fan .....	1
Engine Cooling Fan Drive .....	AC Motor
Traction Equipment:	
Traction and Auxiliary Alternator .....	GMG 194
Alternator Blower .....	1
Traction Motor .....	6-GE752AH™
Traction Motor Blowers .....	2
Blower Drive .....	AC Motor
Air Brake Schedule .....	26-L
Major Dimensions:	
Length .....	70 ft. 8 in.
Height (To Operating Cab Top) .....	15 ft. 4 in. (approx.)
Width .....	10 ft. 3 in. (approx.)
Bolster Centers .....	43 ft. 4 in.
Truck Wheel Base .....	13 ft. 8 in.
Minimum Track Curvature (radius and degrees):	
For Single Unit .....	273 ft/21°
For MU .....	273 ft/21°
Driving Wheel Diameter (in.) .....	40
Weight (nominal, 2%) .....	395,000
Maximum Continuous Tractive Effort / Speed (mph) .....	108,600/11.0
Gear Ratio .....	83/20
Maximum Speed (mph) .....	70
Supplies:	
Fuel Tank (gal.) .....	5000
Coolant (gal.) .....	380
Lube Oil (gal.) .....	410
Sand (cu. ft.) .....	44
Compressor, Air:	
Compressor Drive .....	AC Motor
Maximum Delivery CFM .....	236
Type of Cooling .....	Air
Air Filtering Devices:	
Primary .....	Vortex, Self-Cleaning
Secondary Engine Air Intake .....	AAF
Engine Room Pressurized .....	Yes
Main Generator Pressurized .....	Yes



## OPERATING CONTROLS

### INTRODUCTION

All of the operating devices, manual and visual, normally used by the engineer during locomotive operation are located near the engineer's position. Most of these devices are located either on the Control Console (Figs. 3 and 8), the Engine Control panel (Fig. 9) or on the Overhead Console (Fig. 10).

**NOTE:** *Customer equipment requirements often differ from one railroad to another. Therefore, physical locations and appearance of some devices illustrated in this manual may not agree entirely with the equipment furnished to any particular railroad.*

### DEVICES ON CONTROL CONSOLE (Fig. 3)

The following operating devices are located on the control console:

#### 17KC120D Master Controller

The 17KC120D Master Controller (Fig. 4), is a two-handle, manually operated, set-up switch used by the engineer to regulate locomotive power, dynamic braking and direction. The two handles are the **Reverser** and the **Combined Power**, and their functions are as follows:

1. **Reverser Handle** – Determines the direction of locomotive travel. There are three handle positions; REVERSE, OFF and FORWARD. This handle is removable when the **Combined Power** handle is in IDLE.
2. **Combined Power Handle** – Controls diesel engine speed (THROTTLE and IDLE) and dynamic braking (DYNAMIC BRAKE and SETUP).
  - a. The near position (handle pulled toward engineer) consists of 9 handle positions: IDLE and 8 power positions "notches". Indication of the throttle position is given in the window to the right of the handle.
  - b. The far position (handle pushed away from engineer) consists of 2 handle positions: SETUP and DYNAMIC BRAKE; a variable position ranging from 1 (minimum) to 8 (maximum) for selecting desired brake rate. (Level 8 is the farthest from the engineer.)

Each handle opens and closes cam-operated contacts. The **Combined Power** handle also rotates a wiper arm on a variable resistor dynamic brake pot. Mechanical interlocking between the handles prevents improper operation of any handle.

### Mechanical Interlocking

#### 1. REVERSER HANDLE:

This handle serves as a key to unlock and lock the Reverser. With this handle removed, (it can only be removed in the OFF position), the controller is locked-up and the **Combined Power** handle can not be moved from the IDLE position.

The **Reverser** handle cannot be moved from FORWARD or REVERSE when the Combined Power handle is in: a) Notch 1 or higher of THROTTLE, b) SETUP or c) braking range of DYNAMIC BRAKE.

#### 2. COMBINED POWER HANDLE:

This handle can be moved into throttle positions at any setting of the **Reverser**, but into dynamic braking positions only when the **Reverser** is in FORWARD or REVERSE positions (not OFF).

### Operation Of The Master Controller

To manipulate the controller operating handles during locomotive operation, proceed as follows:

#### LEAD OR SINGLE-UNIT OPERATION

Operating Handle Set-Up (**Reverser** handle removed):

1. **Combined Power** handle is in IDLE.

**WARNING:** *Finding the Combined Power handle away from IDLE with the Reverse handle removed indicates that interlocking between handles requires repair or adjustment. Do not attempt to operate unit until condition has been repaired.*

2. Insert the **Reverser** handle.
3. Set **Reverser** handle for the desired direction of operation.

Operating in Power Mode:

1. Move **Reverser** handle to desired position.
2. Move the **Combined Power** handle to the desired notch.

Operation in Dynamic Brake Mode:

1. Move the **Combined Power** handle to SETUP.
2. Pause momentarily, then advance as desired.

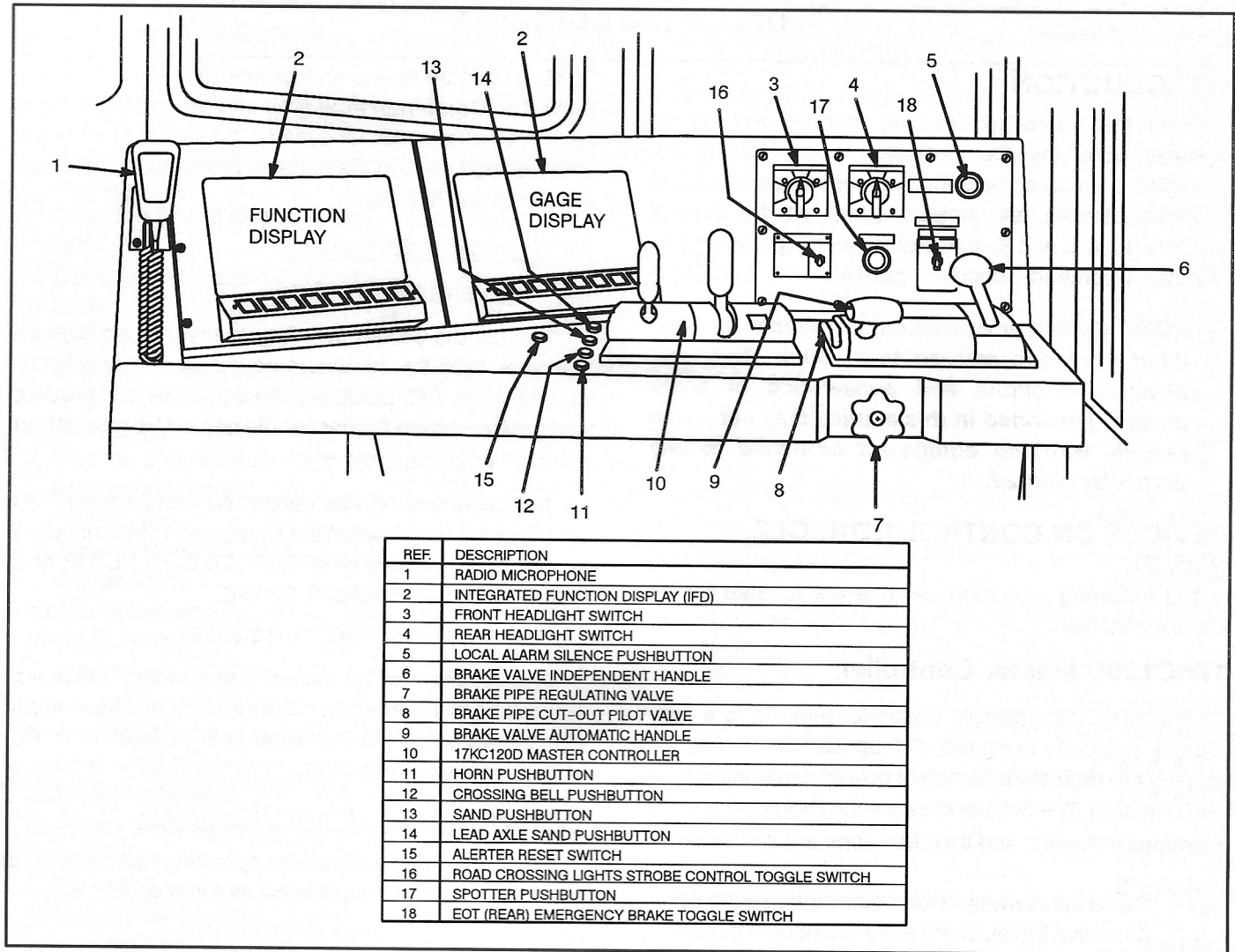


FIG. 3. CONTROL CONSOLE, TOP. E-40974.

## OPERATION AS TRAIL UNIT

**WARNING:** To ensure safe consist operation, follow specific Railroad precautions for securing Trail or Dead units.

1. Combined Power handle in IDLE.
2. Reverser handle centered and removed.

## Integrated Function Displays

The Integrated Function Displays (IFDs) located on the control console (2) are identical, ten-inch diagonal, backlighted, liquid crystal displays (LCD). They have separate displayed functions (Function Display; Gage Display) on Power Up. The left IFD will display the Function Screen and the right IFD will display the Gage Screen. The differences are as follows:

## GAGE SCREEN (Fig. 5)

The following information is displayed on the IFD:

**NOTE:** If any of the analog bars change color indicating an alarm condition, the box surrounding the corresponding digital indication will turn yellow.

**1. Speedometer** – The digital speedometer registers locomotive speed in mph with an alarm mode set above 70 mph. The analog bar graph indicates locomotive speed with a scale of 0–100 mph. The green bar (red above 70 mph) is continuously changing as the data is continuously updated. The ACCELERATION POINTER (yellow) indicates the “predicted” speed 60 seconds from present based on the computed acceleration rate.

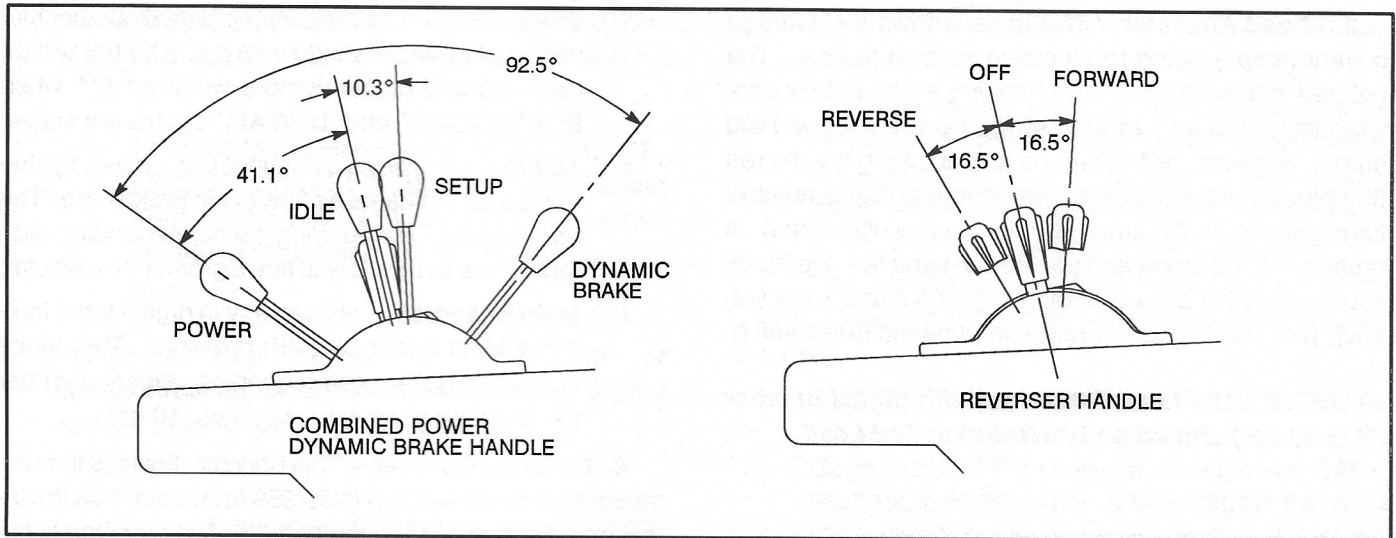


FIG. 4. MASTER CONTROLLER HANDLE POSITIONS. E-38330A.

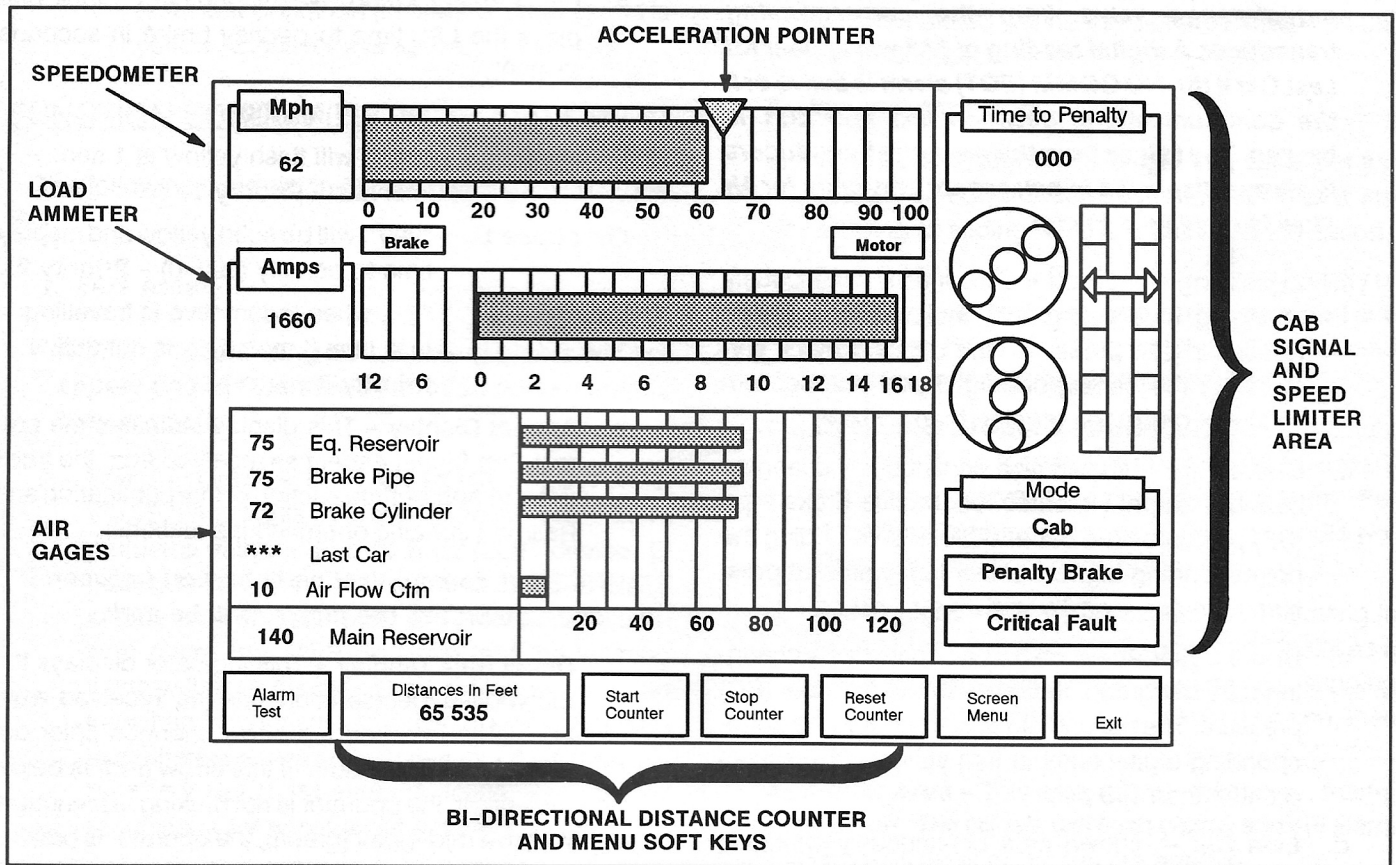


FIG. 5. SAMPLE OPERATOR'S GAGE DISPLAY SCREEN. E-39920A.



**2. Load Ammeter** – This meter shows the average current (amps) going to all cut-in traction motors. The colored bar is continuously changing as the data is continuously updated. **In Motoring**, the bar (below 1400 amps) is green; at 1400 amps and up, the bar turns red (the block surrounding the corresponding digital number turns yellow). **In Braking**, the bar (below 900 amps) is orange; at 900 amps and up, the bar turns red (the block surrounding the corresponding digital number turns yellow). This bar also turns orange at Dynamic Brake setup.

**NOTE: The Load Ammeter (both digital number and bar) should be blank during Self Load.**

### 3. Air Gages –

**NOTE: Data shown on the screen is continuously being updated by the computers. If bar changes from blue to yellow ... a potential problem is indicated. Range for all digital markers is 0–200 while full scale is 0–140 for bar graphs. A digital reading of \*\*\* (without alarm) and no analog graph for a pressure gage indicates an out-of-range value from the corresponding transducer. A digital reading of \*\*\* will appear for Last Car if the NO COMM (EOT) alarm is active or if the communications between IFC and EOT is broken. The values from the pressure transducers is always displayed in psi; except, the value for Air Flow is displayed in cfm.**

- Equalizing Reservoir** – shown as a continuously changing blue bar graph; indicates Equalizing Reservoir (ER) pressure. The bar and block surrounding the corresponding digital number turn yellow at pressures greater than 140 psi.
- Brake Pipe** – shown as a continuously changing blue bar graph; indicates locomotive Brake Pipe (BP) pressure. The bar and block surrounding the corresponding digital number turn yellow at pressures greater than 140 psi.
- Brake Cylinder** – shown as a continuously changing blue bar graph; indicates Brake Cylinder (BC) pressure. The bar and block surrounding the corresponding digital number turn yellow at pressures greater than 140 psi.
- Last Car** – shown as a continuously changing blue bar graph; indicates trainline pressure for break-in-two protection. Data is provided by the End-Of-Train (EOT) device. The bar and block

surrounding the corresponding digital number turn yellow at pressures below 45 psi. The bar will be removed and digital number will read \*\*\* when EOT “NO COM” and “LOW AIR” alarms are active.

- Air Flow** – shown as a continuously changing blue bar graph; indicates air flow in the Brake Pipe. The bar and block surrounding the corresponding digital number turn yellow at flows greater than 60 cfm.
- Main Reservoir** – shown only in digital form; indicates Main Reservoir (MR) pressure. The block surrounding the corresponding digital number turns yellow at pressures below 110 psi.

**4. Distance Counter** – This counter displays the distance traveled in feet (up to 99,999 feet) based on the input from the number two motor tach. The counting is bi-directional (counts up when moving forward; back when in reverse) except when passing through zero where it starts counting up again. Use the soft keys (START COUNTER, STOP COUNTER, RESET COUNTER) to control counter operation.

### 5. Aspect (Locomotive Speed Limiter) System –

- LSL Penalty Marker** – This indicator block displays the LSL time to penalty brake in seconds (0–999):

LSL STATE	MARKER
Penalty Brake	“000”, will flash yellow at 1 sec. intervals – <b>Priority 1.</b>
Over Speed	“999”, will be solid yellow and display time to penalty (999–0) – <b>Priority 2.</b>
Low Speed	“ ”, when locomotive is travelling less than 3 mph, LSL is not active – <b>Priority 3.</b>

- Aspect Display** – This display indicates the correct Cab Signal Aspect as received from the track (refer to appropriate section of this publication and Railroad specific operating instructions).

**NOTE: If communication is broken between IFC and Cab Signal, the display will be dark.**

- Decel Rate Display** – This indicator displays the locomotive deceleration rate as received from LSL. The two-headed arrow changes color depending on LSL value. If this arrow (red) is below mid-point, the operator is not braking fast enough; if above mid-point (green), the operator is braking faster than is actually required; if centered (yellow), the operator is using the correct amount of required braking.

- d. **The Mode, State and Fault Markers** – They display the current LSL mode, state and reason for penalty brake.

- 1) Possible Mode Markers are: NON CAB, CAB, LSL TEST, CS TEST, TRAIL UNIT, CS ONLY and MAINT. The LSL TEST and CS TEST Modes are alarm values and will turn the background to yellow.

**NOTE: If Cab Signal is turned off or communication is broken between Cab Signal and IFC, the Mode display will show \*\*\*.**

- 2) Possible Cab Signal State Markers are (in order of priority): PENALTY BRAKE, OVER SPEED, LOW SPEED and CS INOPERATIVE. The surrounding marker field is yellow when active. **Note: More than one state may be active at the same time.**
- 3) The CS Alarm Marker displays either the reason for the Penalty Brake or displays the current Fault Condition (in order of priority) and is yellow whenever it is active.

## FUNCTION SCREEN (Fig. 6)

The following information (by area) is displayed on the IFD:

### 1. EOT Area –

**NOTE: The following EOT Warning Lights will not appear on the Operator's Function screen unless they are active.**

- a. **Warning Lights** – LOW AIR, NO COM, LOW BATT, VALVE FAIL lights (yellow) indicate component problems with the End of Train (EOT) device. [If battery is dead, the alarm will read DEAD BATT and be red.] The computer will order the Audio Visual Alarm Box (AVB) to beep and the warning lights will flash (white/yellow) for ten seconds on transition from inactive to active or when changing to a different active state. Value for **LAST CAR** will be \*\*\* if **NO COM** alarm is active. See *railroad regulations for appropriate action*.
- b. **Set-Up Indicators** – These displays show the EOT transmitter code, whether the last car is moving or not, whether the marker is ON or OFF and

distance (from the independent IFD counter) traveled.

- c. **EOT Emergency Marker** – This display lists the status of the two-way EOT emergency system. Possible indications are: Enabled; Disabled; One Way. This block will also show \*\*\* if communication is broken between IFC and EOT.

**2. Cab Signal Area** – These indications mimic the Cab Signal information presented on the Gage Display. They are:

- a. **Cab Signal Aspect Marker** – This block will list the state that matches the Aspect Display on the Gage Display. The possible displays are: DARK, RESTRICT, APPROACH, APP MED and CLEAR. If IFC is unable to communicate with Cab Signal, this display will read DARK.
- b. **Time To Penalty** – This block displays the count-down time to LSL Penalty Brake in seconds.
- c. **Mode** – This block displays the LSL mode as indicated by Cab Signal.
- d. **Cab Signal State and Alarm Markers** – The shown markers will be the same as shown on the Gage Screen.

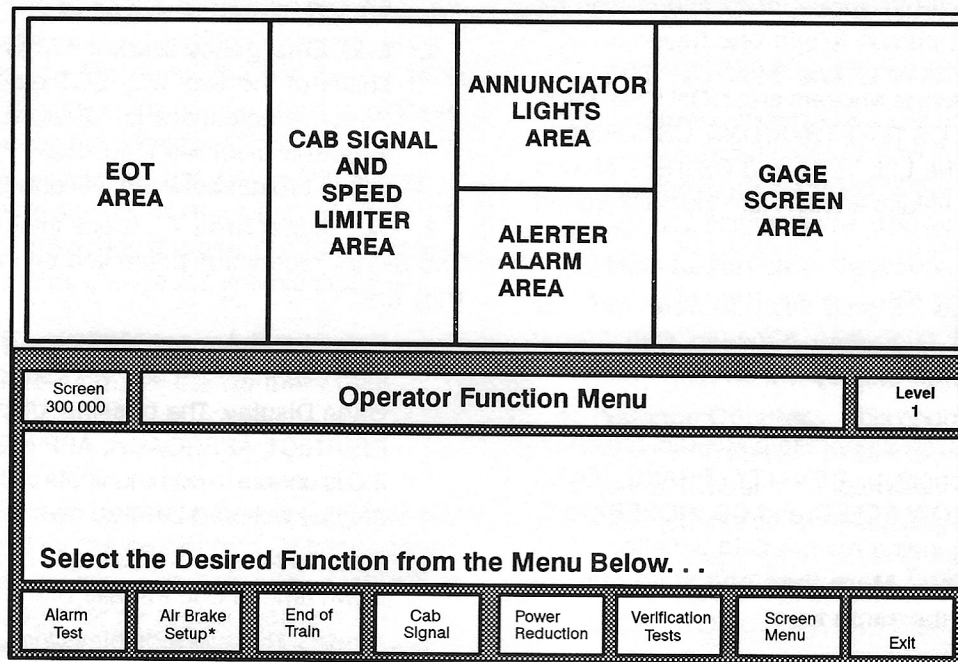
### 3. Annunciator Lights –

- a. **WHEELSLIP Light** – This light indicates that the wheels on some locomotives in the consist are slipping or sliding. This is a trainlined indication.
- b. **PCS OPEN Light** – This light indicates a Penalty or Emergency air brake application has occurred and power has been limited to Notch 1. See Railroad operating rules for specific application.
- c. **DYNAMIC BRAKE WARNING Light** – This light indicates that a locomotive in the consist is experiencing excessive dynamic braking current. Reduce the **Combined Power** (Braking) Handle position until this light goes out.
- d. **SAND Light** – This light indicates that sanding is taking place either manually or automatically as a result of wheelslip. During a wheelslip, sanding and the SAND light will automatically turn on, then off.

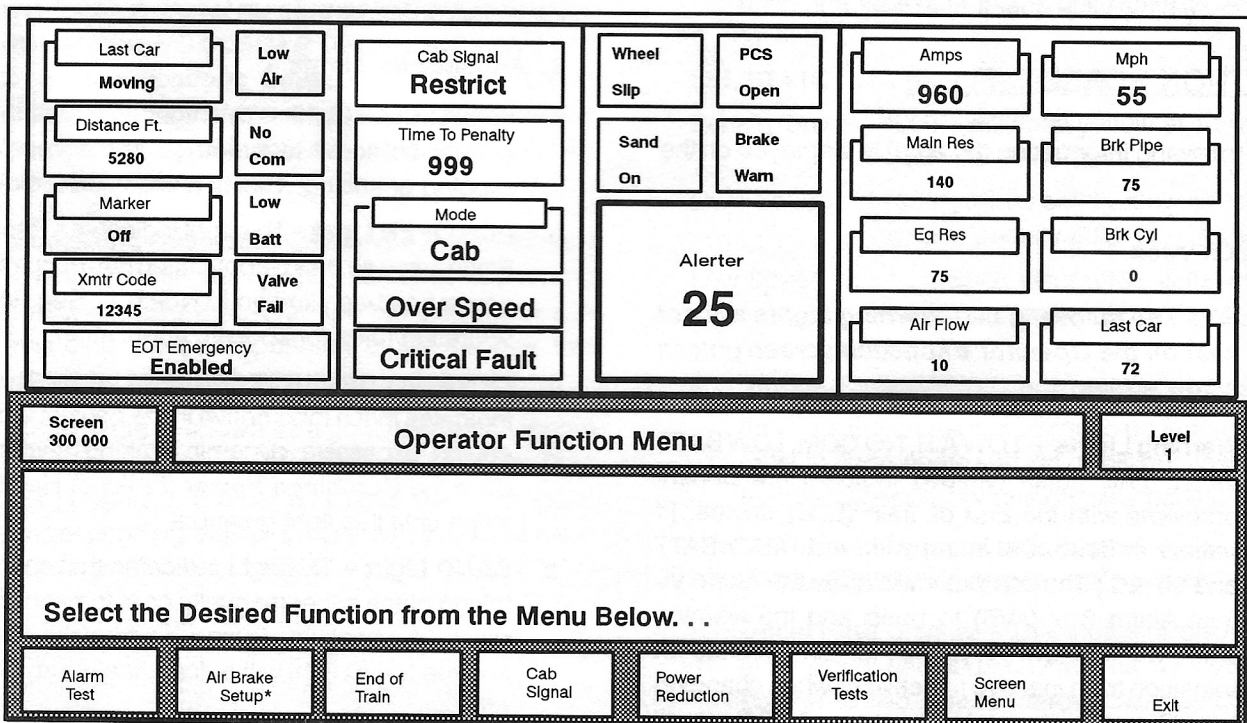
**4. Alerter Area** – This area counts down to an Alerter Penalty Brake. The square will flash yellow and the alarm will sound until reset or brakes are applied.

**NOTE: The Alerter system will flash yellow and count down from 25 if proper operator response**





## SCREEN INFORMATIONAL AREAS



\* OPTION: BLOCK WILL NOT APPEAR UNLESS UNIT IS EQUIPPED WITH THE EPIC 3102 AIR BRAKE SYSTEM.

FIG. 6. SAMPLE OPERATOR'S FUNCTION DISPLAY SCREEN. E-40975.



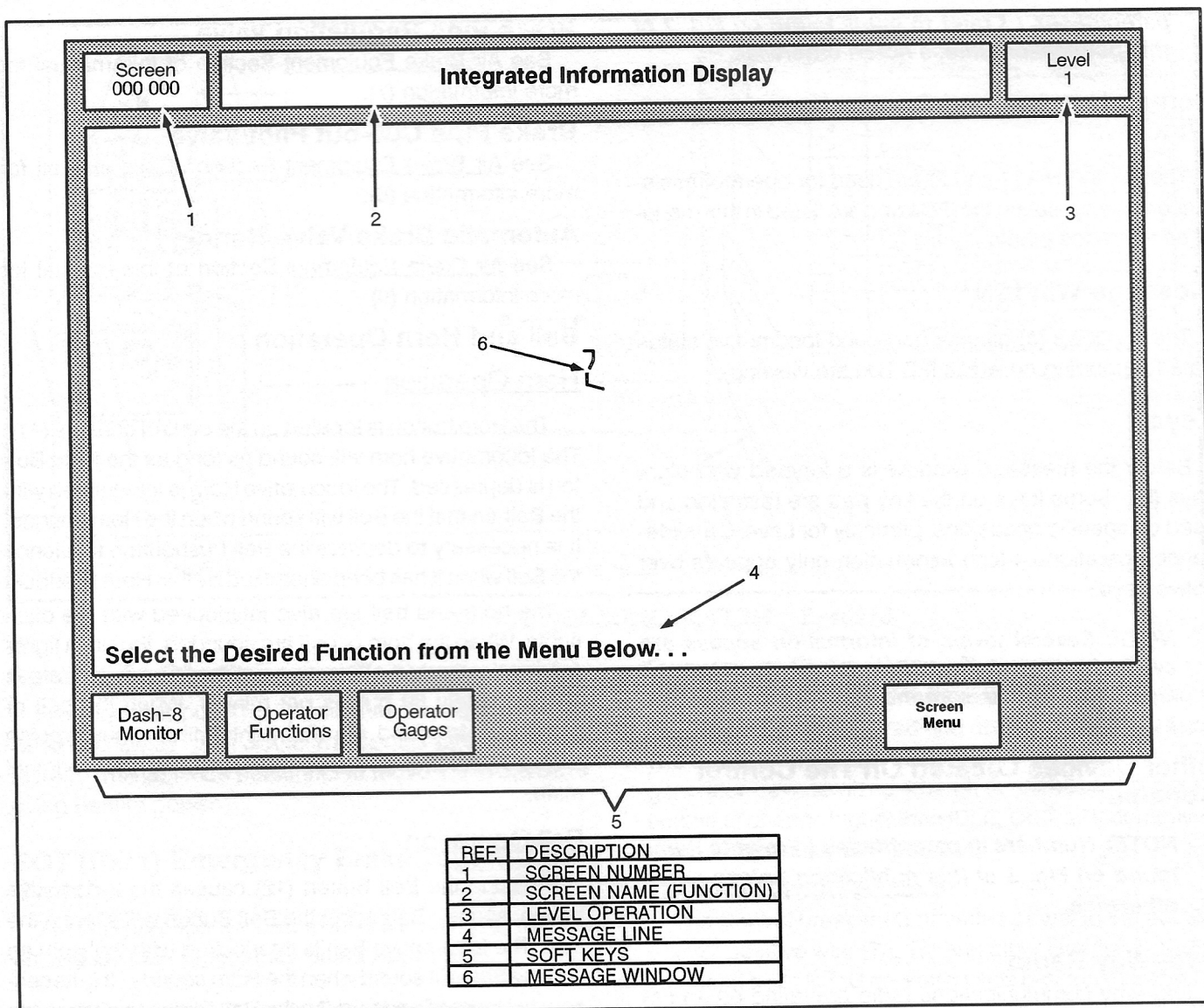


FIG. 7. TOP LEVEL IFD SCREEN (000 000). E-39672D.

*has not been detected. See Operating Procedures Section of this manual for further information.*

**5. Gage Display Area** – All critical information shown on the Gage Display Screen is listed here in compressed form (i.e., data is shown in numerical form only – no graphical representations). This data is updated continuously. This feature is included in the event that an IFD might malfunction – all the needed information to operate the locomotive will be displayed by selecting the Function Screen.

## DISPLAY SCREEN PARTS

**NOTE:** IFD screen layout is customer specific. Customer equipment requirements often differ from one railroad to another; therefore, screen illustrations and documentation may not entirely agree with the equipment furnished to any particular railroad. Also, the numbers in

*parentheses ( ) refer to items found on Fig. 7 of this publication unless noted otherwise.*

## Screen Number and Screen Name Windows

These windows (1 and 2) are used for operator assistance while operating the IFDs and are listed in this manual as reference points.

## Message Window

The windows (6) display gage and locomotive status data (depending on which IFD you are viewing).

## Keys

Below the message window is a keypad with eight keys (5). Some keys on the key pad are restricted and used on specific occasions, primarily for Level 2 maintenance operations. Menu information only appears over active keys.

**NOTE: Several levels of information access are available through the IFD screens. Only Level 1 Operation of the screens is discussed in this publication.**

## Other Devices Located On The Control Console

**NOTE: Numbers in parentheses ( ) refer to items found on Fig. 3 of this publication unless noted otherwise.**

## Two-Way Radio

Two-way communications radio operating on an FM band. Hand held microphone (1) is mounted on the Control Console.

## Short-Hood Headlight Switch

This switch (3) controls the operation of the short-hood headlight and has four positions; OFF, DIM, MED and BRIGHT.

## Long-Hood Headlight Switch

This switch (4) controls the operation of the long-hood headlight and has four positions; OFF, DIM, MED and BRIGHT.

## Local Alarm Silence Pushbutton

Pressing this pushbutton (5) will silence the alarm bell.

## Independent Brake Valve Handle

See Air Brake Equipment Section of this manual for more information (6).

## Brake Pipe Regulating Valve

See Air Brake Equipment Section of this manual for more information (7).

## Brake Pipe Cut-out Pilot Valve

See Air Brake Equipment Section of this manual for more information (8).

## Automatic Brake Valve Handle

See Air Brake Equipment Section of this manual for more information (9).

## Bell and Horn Operation

### Horn Operation

The Horn button is located on the control console (11). The locomotive horn will sound as long as the Horn Button is depressed. The locomotive Horn is interlocked with the Bell so that the Bell will sound when the Horn sounds. It is necessary to depress the Bell Pushbutton to silence the Bell when it has been energized by this Horn interlock.

The horn and bell are also interlocked with the ditch lights. When the horn or bell are sounded, the ditch lights automatically start alternating pulsing. The pulse rate is approximately 60 pulses per minute. When the bell or horn cease to sound, the ditch lights will continue to pulse for 30 additional seconds then return to their original state.

### Bell Operation

Pressing the Bell Button (12) causes the locomotive bell to sound. Releasing the Bell Button will silence the Bell. The locomotive Bell is interlocked with the Horn so that the Bell will sound when the Horn sounds. It is necessary to depress and release the Bell Button to silence the Bell when it has been energized by the Horn interlock.

## Sand Button

Pressing this button (14) applies sand to the rail in front of the leading axle of each truck when locomotive speed is less than 7 mph. Above 7 mph, manual sanding is not available. Lead axle sand will still function normally.

## Lead Axle Sand Button

Pressing this button (15) applies sand to the rail in front of the leading axle, depending on locomotive direction, regardless of speed.

## Alerter Reset Switch

Toggleing this "switch" (16) manually resets the Alerter device. This pushbutton must be pressed at micro-computer set intervals or a penalty brake application will occur. See appropriate section of this publication for more information.

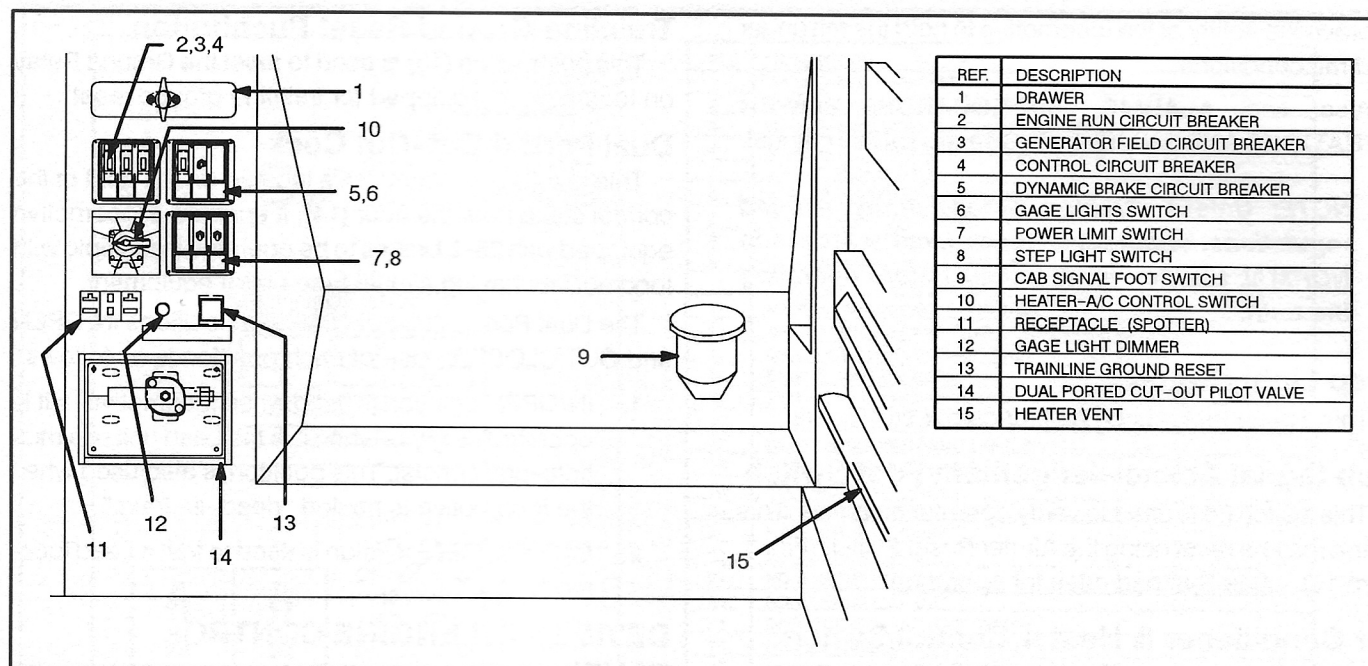


FIG. 8. CONTROL CONSOLE, BOTTOM. E-40976.

### Spotter Pushbutton

Pressing this button (17) activates the spotter circuit (when EC switch is in JOG). The spotter circuit enables railroad maintenance personnel to move the locomotive using battery power.

### EOT (Rear) Emergency Brake Toggle Switch

Pressing this spring-loaded toggle switch (18) initiates an End Of Train Emergency Brake Application.

### Road Crossing Lights Strobe Control Toggle Switch

This switch (19) is used to test the strobe control of the road crossing lights. Flipping switch to ON, the road crossing lights will pulse for 30 seconds and then return to their original state (ON or OFF).

**NOTE:** Numbers in parentheses ( ) refer to items found on Fig. 8 of this publication unless noted otherwise.

### Engine Run Circuit Breaker

This breaker (2) controls engine speed. It must be ON in lead unit and OFF in other units of the consist to control engine speed through the throttle speed and engine run trainlines. When breaker is tripped, engine will not power above notch one.

### Generator Field Circuit Breaker

The Generator Field circuit breaker (3) is ON whenever the locomotive is powered and operating as a Lead unit. The breaker may be turned OFF to keep the main generator de-energized when it is necessary to run the engine at speeds higher than IDLE. On Trail locomotives, it should be in the OFF position.

### Control Circuit Breaker

The Control breaker (4) provides power to the trainline control positive wire (T/L 13) and other circuits, including the alarm bell. In MU operation, this breaker must be ON on the Lead unit only.

### Dynamic Braking Control Breaker

The Dynamic Braking Control breaker (5) is used to control the dynamic braking of the locomotive. In MU operation, this breaker must be ON on the Lead unit only to control the dynamic braking of other units in the consist.

### Gage Light Switch

This switch (6) turns on the engineer's console gage lights.

### Power Limit Switch

This switch (7) has two positions, NORMAL and NOTCH 7. When the locomotive consist is in Notch 8 and the lead unit is slipping excessively, the Power Limit switch can be moved to NOTCH 7 to reduce power while the trailing units are operating at full power. This will reduce the tractive effort on the lead unit and will usually



improve the ability of the locomotive to hold the rail under bad rail conditions.

Also see **ALARMS, SAFEGUARDS, POWER DERATIONS AND SHUTDOWNS** section of this manual.

**NOTE: Unless directed otherwise by railroad regulations, ensure the Power Limit switch is in NORMAL position on ALL units before operating the train.**

### Step Light Switch

This switch (8) turns on all four corner step lights.

### Cab Signal Acknowledgement Foot Switch

This switch (9) is used to verify operator alertness. This alarm may be reset using the Alerter Reset Switch (Fig. 3, Item 16). See Railroad rules for operation.

### Air Conditioner & Heater Control Switch

The Air Conditioner and Heater Control Switch (10) has eight positions as follows:

<b>OFF</b>	Shuts off the Air Conditioner and Heater unit.
<b>LOW FAN</b>	Provides air circulation at LOW fan speed.
<b>HIGH FAN</b>	Provides air circulation at HIGH fan speed.
<b>LOW HEAT</b>	Provides low heat at low fan speed.
<b>MED HEAT</b>	Provides medium heat at high fan speed.
<b>HIGH HEAT</b>	Provides maximum heat at high fan speed.
<b>LOW COOL</b>	Provides low cooling air at low fan speed.
<b>HIGH COOL</b>	Provides maximum cooling air at high fan speed.

**NOTE: The Heater/Air Conditioner Circuit Breaker on the Circuit Breaker panel, located below the EC panel (Fig. 9) must be ON to operate Air Conditioner and Heater.**

### Hot Plate Receptacle

This 74 VDC receptacle (11) has been provided to enable use of a hot plate.

### Gage Light Dimmer Knob

The dimmer (12) knob is used to brighten and dim the console gage lights.

### Trainline Ground Reset Pushbutton

This pushbutton (13) is used to reset the Ground Relay on locomotives equipped for trainline ground reset.

### Dual Ported Cut-Out Cock

This is a two-position valve located on the front of the control stand near the floor (14). It enables a locomotive equipped with 26-L brakes to be operated in multiple with locomotives having similar type brake equipment.

The Dual Ported cut-out cock has positions IN/OPEN and OUT/CLOSED. Use of each position is as follows:

1. IN/OPEN position is used when locomotive unit is operated singly or when it is the Lead unit of a multiple-unit consist. This position is also used when the locomotive is hauled "dead-in-train."
2. OUT/CLOSED position is used to trail a Lead locomotive.

## DEVICES ON ENGINE CONTROL PANEL

**NOTE: Numbers in parentheses ( ) refer to Items found on Fig. 9 of this publication unless noted otherwise.**

The Engine Control (EC) panel is located on the long-hood wall of the operator's cab. Mounted on this panel are various switches, circuit breakers and operating devices used during locomotive operation.

### Top Row of Circuit Breakers

The top row of circuit breakers (1-4) on the EC panel are used for equipment that can be turned OFF when the unit is operating as a Trail unit.

### Second Row of Circuit Breakers

The second row of circuit breakers (6-12) on the EC panel are used for equipment, ALL OF WHICH MUST BE LEFT ON whenever the unit is operating as a Lead or Trail unit.

### Engine Stop Button

To shut down the engine, press the Engine Stop button (5).

### Flange Lubricator

The flange lubricator timed disable (6) and system (7) circuit breakers enable the flange system to operate. When the disable button is pressed (in high-adhesion situations), the flange lubricating system is disabled for fifteen minutes.

### Diagnostic Display Panel (DID)

See **DIAGNOSTIC DISPLAY PANEL** section of this manual.

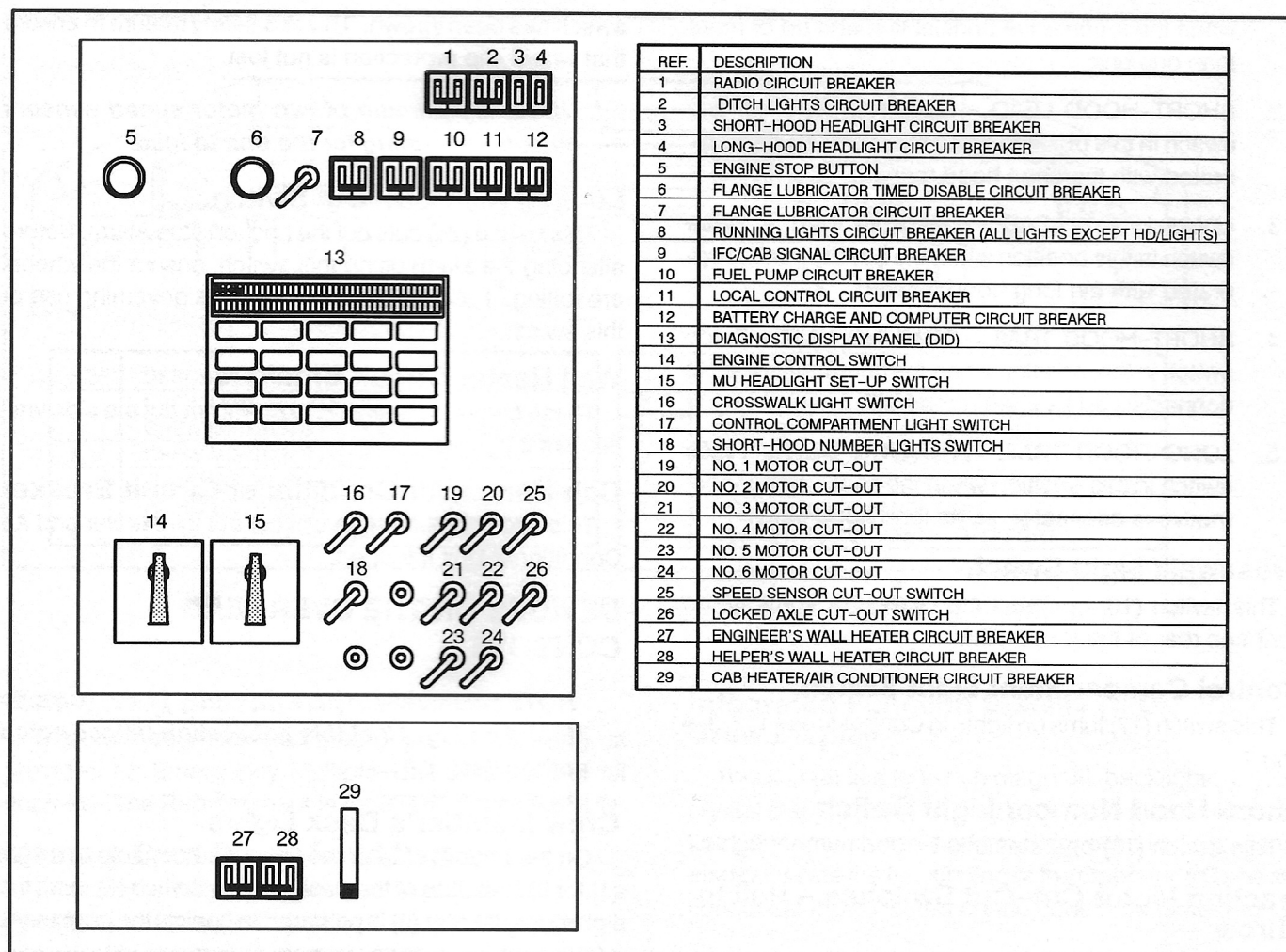


FIG. 9. ENGINE CONTROL PANEL. E-40977.

## Engine Control Switch

The Engine Control (EC) switch (14) has four positions:

1. **START** – The Engine Start switch, see Engine Start Station, is effective only when the EC switch is in START. When the engine is running and the EC switch is in START position, engine speed is held at IDLE and power cannot be applied to the locomotive. The power plant is said to be “off the line.” The alarm bell will not ring if the engine shuts down.
2. **ISOLATE** – When the engine is running and the EC switch is in the ISOLATE position, the engine speed is held at IDLE and power cannot be applied to the locomotive. The message “ISOLATED” will appear on the Diagnostic Display Panel. The alarm bell will sound if a fault occurs that will shut down the engine.

3. **RUN** – When the engine is idling and the locomotive is to be operated, the Engine Control (EC) switch must be moved to the RUN position.

**NOTE:** If the EC switch is left in the RUN or ISOLATE position when the diesel engine is shut down, the alarm bell will sound.

4. **JOG** – When the engine is shutdown and the locomotive is to be moved using battery power, the EC switch is moved to the JOG position.

## MU Headlight Set-Up Switch

The MU Headlight Set-Up switch (15) has five positions. Positioning of this switch is determined by location of the locomotive unit in the consist and whether the short hood of the locomotive unit is leading or trailing. Switch positions are as follows:

1. **SINGLE OR MIDDLE UNIT** – Place switch in this position on any locomotive unit operated singly or on all units, except the Leading or Trailing unit,



when the locomotive consist is made up of more than one unit.

2. **SHORT-HOOD LEAD – LEADING UNIT** – Place switch in this position when the Leading unit is operated with the short hood forward.
3. **LONG-HOOD LEAD – LEADING UNIT** – Place switch in this position when the Leading unit is operated with the long hood forward.
4. **SHORT-HOOD TRAIL – TRAILING UNIT** – Place switch in this position when the final Trailing unit is connected so its short hood trails.
5. **LONG-HOOD TRAIL – TRAILING UNIT** – Place switch in this position when the final Trailing locomotive is connected so its long hood trails.

### Crosswalk Light Switch

This switch (16) operates the crosswalk lights at the front and rear of the locomotive.

### Control Compartment Light Switch

This switch (17) turns on lights in Control Areas 1, 2, 3, 4 and 7.

### Short-Hood Number Light Switch

This switch (18) operates short-hood number lights.

### Traction Motor Cut-Out Switches – Pull to Throw

The Motor Cut-Out switches (19–24) can be used to cut-out one or more traction motors. At the same time, power output of the locomotive may be reduced. See Alarms, Safeguards, Power Derations And Shutdowns section of this publication.

**CAUTION:** *It is recommended that these switches be operated only with the Engine Control switch in START or ISOLATE position so the unit is isolated and the Combined Power Handle in IDLE. Dynamic Brake operation could be affected.*

Under emergency conditions, the locomotive may be operated for a short period of time with one or more motors cut-out. Refer to railroad rules for specific details of operation.

### Speed Sensor Cut-Out Switch

This switch (25) cuts out the Speed Sensor signal on all traction motors that are cut-out. This switch is only to be used to cut out faulty sensors; however, ensure that the sensor is at fault and not that it is indicating a locked axle or excessive wheel slip, etc. The sensor will only be cut out (even if switch has been thrown) if the motor cut-out

switch has been thrown. This is a safety feature to ensure that wheel slip protection is not lost.

**NOTE:** *A minimum of two motor speed sensors must be operating for the unit to load.*

### Locked Axle Cut-Out Switch

This switch (26) cuts out the Locked Axle Alarm. Before silencing the alarm using this switch, ensure the wheels are rolling. Follow railroad regulations governing use of this switch.

### Wall Heater Circuit Breakers

These circuit breakers (27, 28) will cut out the side wall heaters if tripped.

### Cab Heater/Air Conditioner Circuit Breaker

This circuit breaker (29) will cut out the Heater and Air Conditioner Unit if tripped.

## DEVICES ON THE OVERHEAD CONSOLE

**NOTE:** *Numbers in parentheses ( ) refer to Items found on Fig. 10 of this publication unless noted otherwise.*

### Crew Member's Desk Lights

On the bottom side of the Overhead console is a light (1) for illumination of the desk area. A Switch (3) turns the light on, a dimmer (2) is provided to control the brightness of the light.

### Alerter Box And Alarm

The Audio Visual Alarm Box (AVB) is used to alert the operator of various operating alarms (from Alerter, Cab Signal and EOT). The AVB (4) is programmable for audio frequency, tone and volume as well as flashing light patterns of variable intensity.

### Radio

This device (5) enables the crew to control the rack-mounted voice radio located in the equipment Locker. See specific Railroad Operating Instructions.

### Engineer's Console Light

On the bottom side of the Overhead console is a light (6) for illumination of the Control Console area. A Switch (8) turns the light on, a dimmer (7) controls the brightness of the light.

### Attendant Call Button

The Attendant Call button (9) is used to sound the alarm bell in all locomotive units. This button can be used to test the alarm bell when boarding the locomotive.



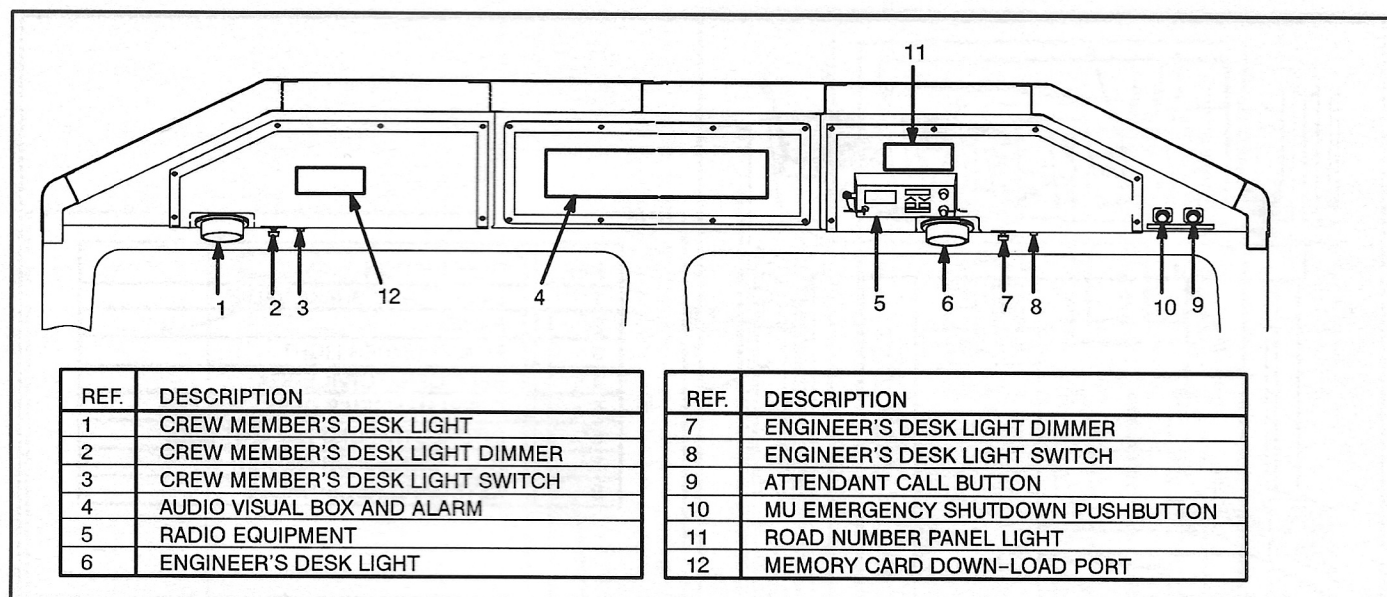


FIG. 10. OVERHEAD CONSOLE. E-39923A.

### Emergency Shutdown Pushbutton

This two-segment (red/green) pushbutton (10) is provided for Emergency Multiple-Unit Shutdown of all engines. The Red segment is for STOP; Green for RUN.

### Memory Card Down-Load Port

This device (12) is supplied to enable maintenance personnel to down-load pertinent locomotive data to a non-volatile removable memory card.

## DEVICES IN CREW MEMBER'S AREA

**NOTE:** Numbers in parentheses ( ) refer to items found on Fig. 11 of this publication unless noted otherwise.

### Emergency Brake Valve

The handle of the emergency brake valve (1) is located at the back of the crew member's desk. Lifting this handle causes an Emergency brake application.

### Two-Way Radio Equipment

A radio auxiliary control head (2) ties-in with the two-way radio equipment located in the Overhead Console (Fig. 10, Item 5). A hand held telephone-style microphone (7) is also mounted on this console for helper use.

### Refrigerator

A refrigerator unit (4) is mounted in the crew member's area facing the stairway into the Nose cab area.

### Integrated Function Display (IFD), Crew Display

This IFD (6) is a ten-inch diagonal, backlit, liquid crystal display (LCD). It may be used to monitor locomotive performance and perform diagnostic testing. It may also duplicate the functioning of the Operator's Gage and Functional IFDs located on the control console (Fig. 3).

### Other Devices

Receptacles (7 and 8) are provided for Portable Test Units (PTU) and keyboards. A road number indicating light (3) is also included on the Crew Member's desk.

## OTHER OPERATOR CAB FEATURES

### Toilet Compartment (Fig. 12)

Located in the nose cab on the A-side of the locomotive, adjacent to the Helper's Desk.

### Battery Switch (Fig. 13)

Located behind door below the Engine Control panel.

### Engineer's and Crew Member's Dome Lights and Windshield Wiper Valves (Fig. 14)

Located and controlled above the engineer's and crew member's positions.

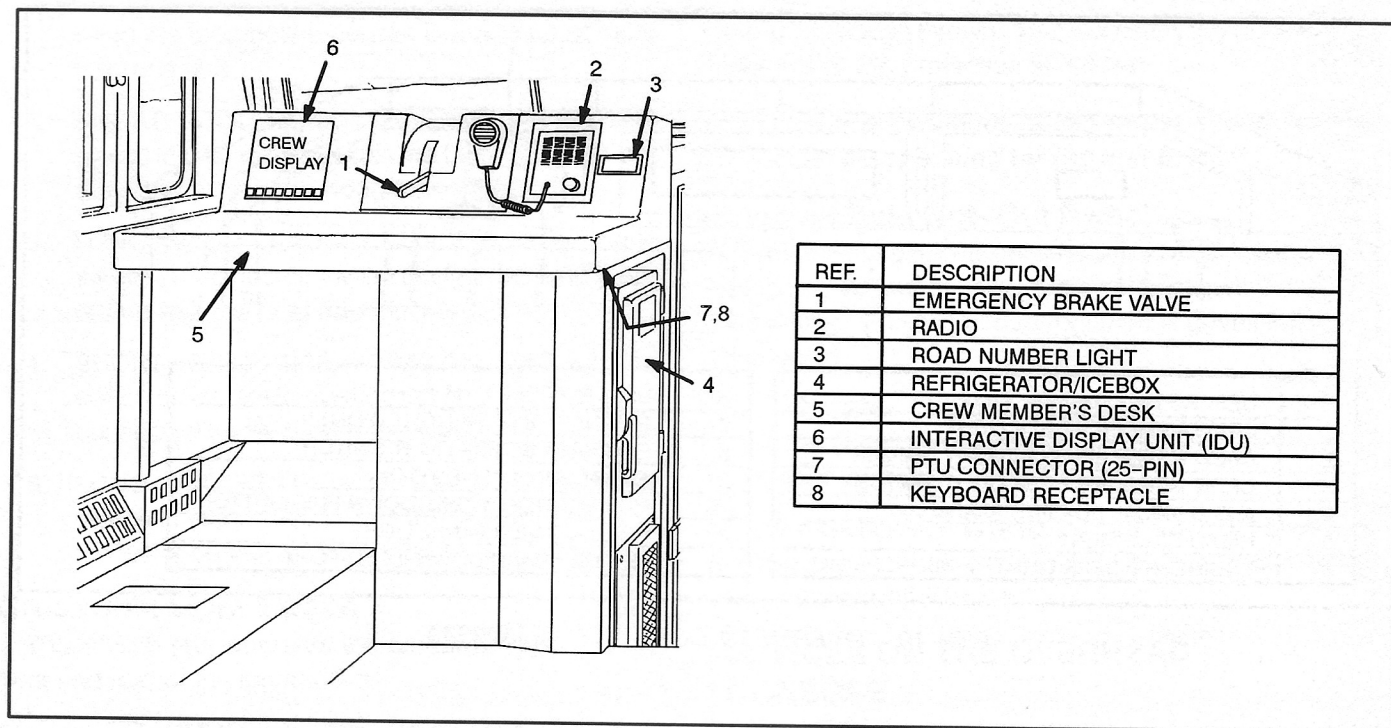


FIG. 11. CREW MEMBER'S AREA. E-39922B.

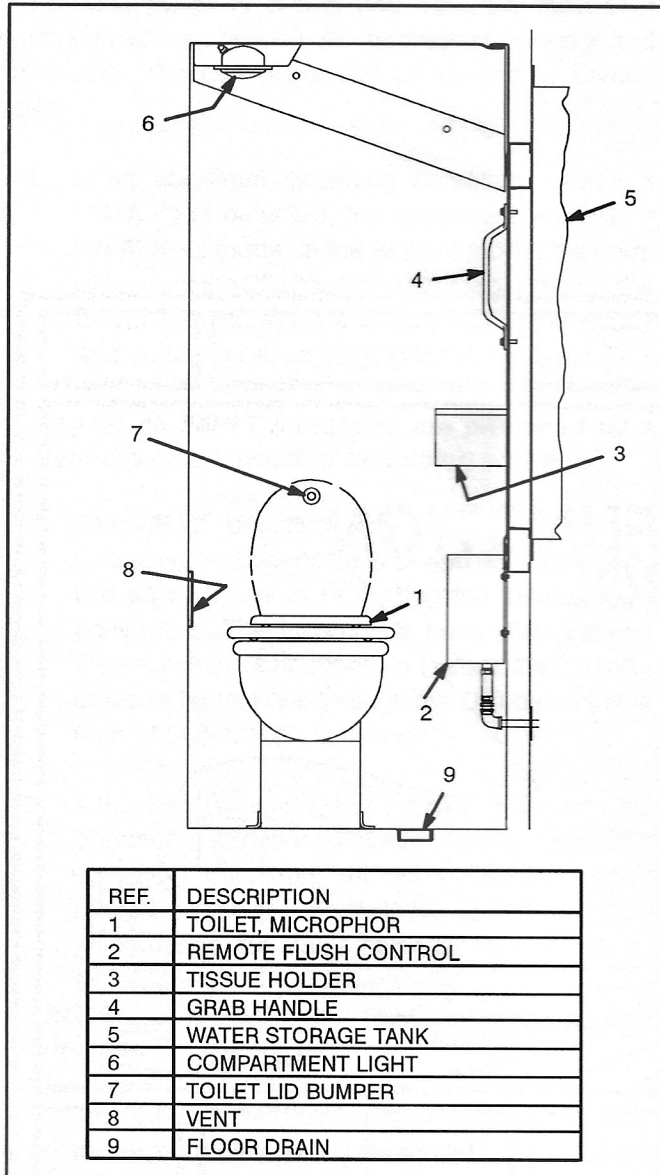


FIG. 12. TOILET COMPARTMENT (TYPICAL).  
E-40696.

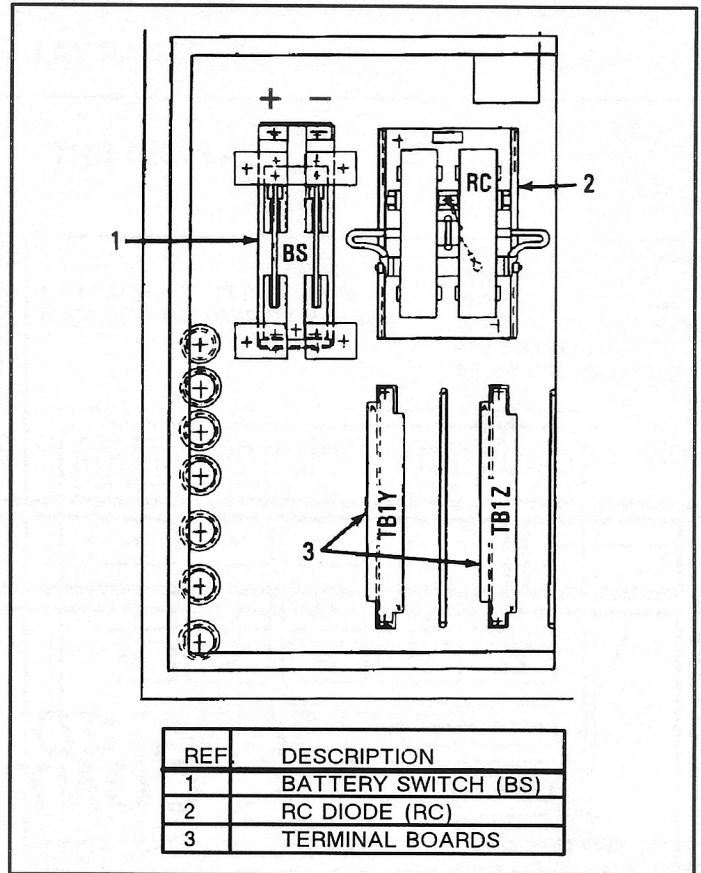


FIG. 13. BATTERY SWITCH COMPARTMENT BENEATH  
ENGINE CONTROL PANEL. E-37764.

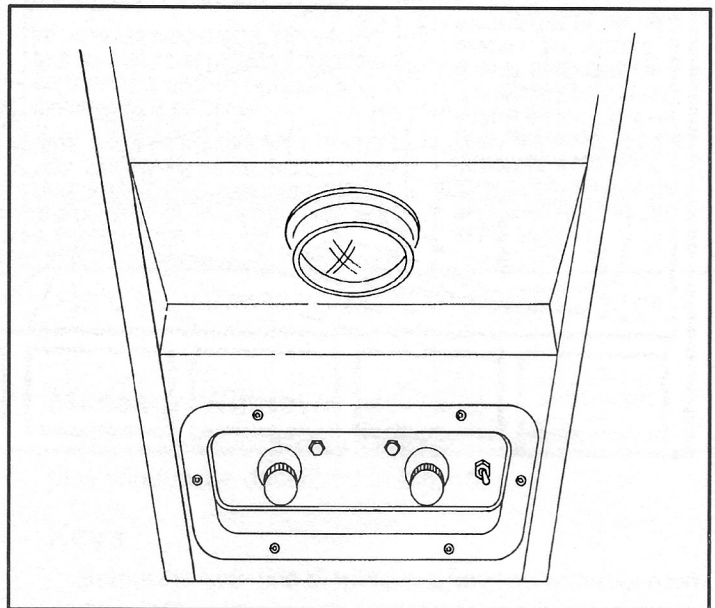
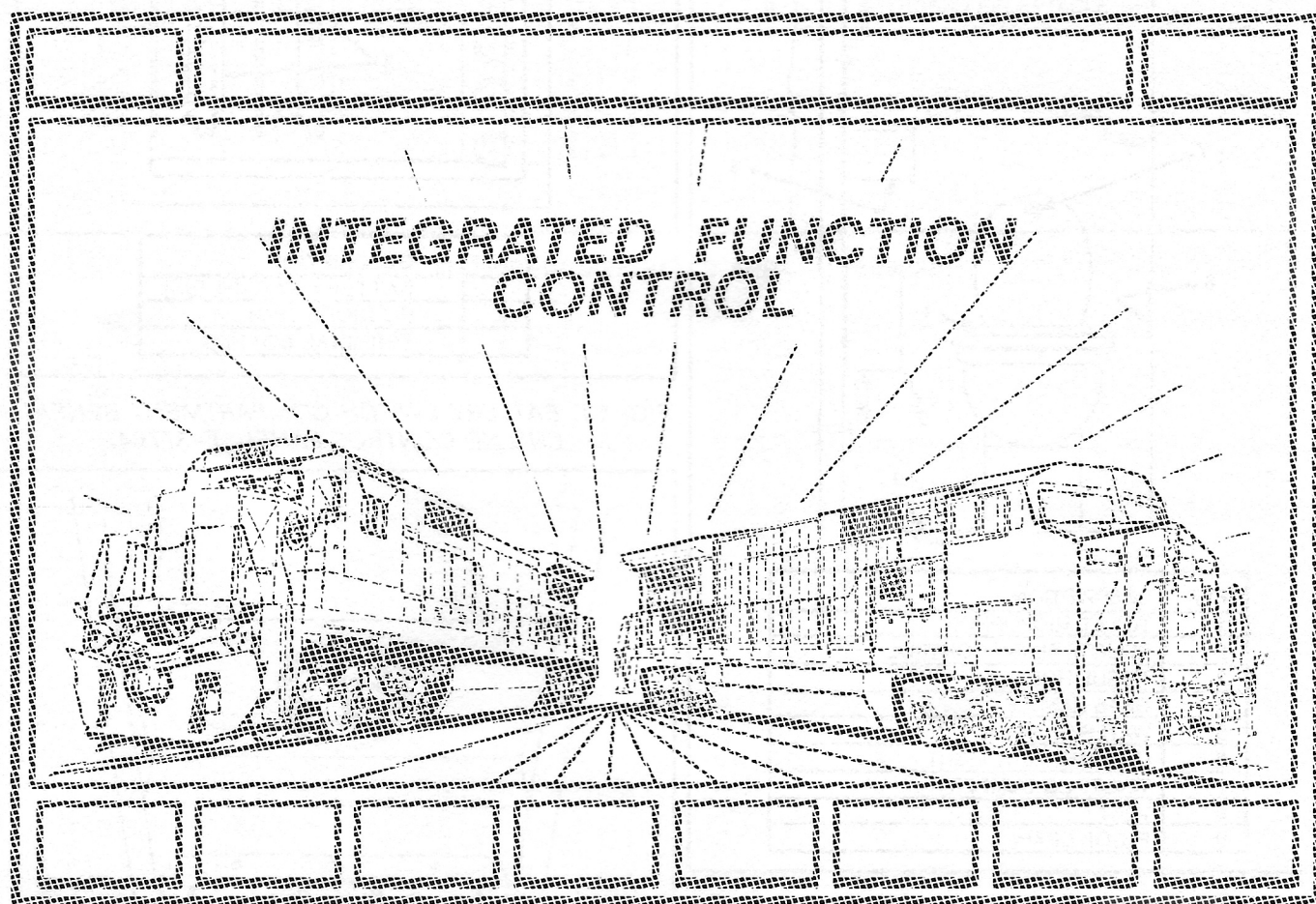


FIG. 14. ENGINEER'S AND CREW MEMBER'S  
OVERHEAD DOME LIGHT AND WIPER CONTROLS.  
E-40735.





## DIAGNOSTIC DISPLAY PANEL (DID)

### GENERAL INFORMATION

The DID panel is a fast and accurate means of communications between the locomotive operator and computers. The DID panel can be utilized in several ways:

1. If an abnormal operating condition (called a "FAULT") is detected, the computers will initiate the ALARM mode. In the ALARM mode, the computer uses the DID panel to alert the operator to the FAULT by displaying a description of the FAULT and, in some cases, ringing the Alarm bell.

**NOTE: All FAULT messages are preceded by a four digit Fault Number beginning with a "4".**

2. The FAULT detected may require that certain operating restrictions be imposed on the locomotive as a means of protecting the locomotive's equipment. The locomotive computers impose the necessary restrictions and inform the operator of those restrictions through the DID panel in the form of SUMMARY messages.
3. A SUMMARY message on the display, informs the operator of the general status of the locomotive's operating condition, its computers, restriction placed on the locomotive due to faults and, in some cases, the status of the display itself.

**NOTE: A SUMMARY message is not preceded by a number.**

4. The FAULT is recorded in a FAULT "Log" for later review by maintenance personnel.
5. The operator can use the DID panel to review active FAULTS and their related restrictions (SUMMARY messages). The DID panel also enables the operator to reset FAULTS, and attempt to return the locomotive to normal operation.

**NOTE: In accordance with railroad selected options, in some cases, the ability to reset certain FAULTS has been restricted to maintenance personnel.**

### THE DISPLAY

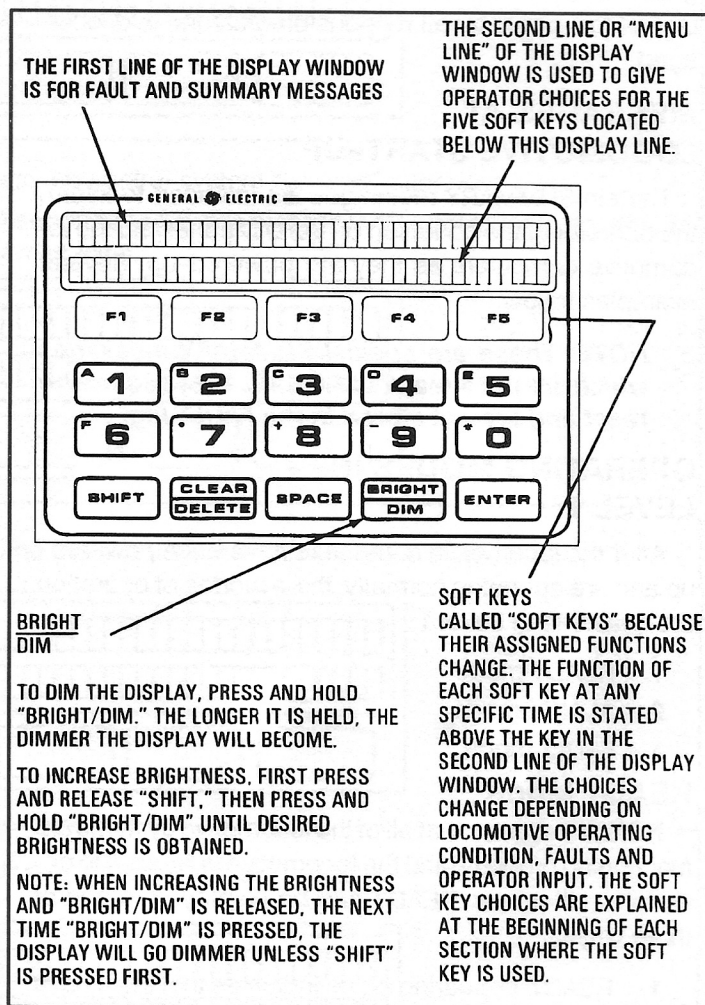


FIG. 15. DIAGNOSTIC DISPLAY PANEL. E-32790A.

### Message Windows

The Diagnostic Display (DID) panel has a two-line display window as described in Fig. 15.

### Keys

Below the two-line display is a keypad with four rows of keys. Fig. 15 describes the use of these keys in Level 1. Other keys on the key pad are used on specific occasions, primarily for Level 2 maintenance operations.

**NOTE: Several levels of information access are available through the DID panel. Only Level 1**

*Operation of the panel is discussed in this publication.*

## Using The Display

If a mistake is made while using the DID panel in Level 1, locomotive operation will not be interrupted or degraded and locomotive equipment will not be damaged. Use of this panel by all responsible persons is encouraged.

## MESSAGES AT LOCOMOTIVE START-UP

Certain SUMMARY messages are intended to inform the operator of the condition on the DID panel and the locomotive computers as they are powered-up. Several examples follow:

**NOTE:** *These are special SUMMARY messages which are not a result of FAULTS. They require no reset and are not stored in the FAULT log.*

## OPERATING MODES IN LEVEL 1

After the locomotive computers have been powered-up and are operating normally, three modes of operation are available in Level 1:

1. READY mode
2. ALARM mode
3. FAULT mode.

### READY Mode

READY indicates that all of the locomotive systems are functioning properly, and the locomotive is "ready" to operate at full power. READY can be displayed in one of three ways:

1. READY, appearing alone indicates that there have been no FAULTS detected, or reset.
2. "READY-Work Report Stored" indicates a FAULT has occurred, it has been reset, and all operating restrictions imposed by the FAULT have been removed.
3. Some FAULTS do not impose operating restrictions on the locomotive. When this type of FAULT occurs, "READY - Fault Message Stored" will be displayed.

**NOTE:** *As can be seen on the SUMMARY message list, Page 30, these READY messages are the three lowest priority messages. They will not be displayed if higher priority SUMMARY messages (operating restrictions) exist.*

## ALARM Mode

The computers check locomotive operation on a continuing basis. If an abnormal condition (FAULT) is detected, the ALARM mode may be initiated by the locomotive computers.

**NOTE:** *If the computer initiates the ALARM mode, when the DID panel is operating in any other mode, it will interrupt that mode to display the ALARM. When the ALARM mode is completed, the display will return to its previous operating mode.*

When the ALARM mode is initiated, a description of the problem will be given on the first line of the display in the form of a FAULT MESSAGE, the word "Silence" will appear on the second line of the display and, in most cases, an alarm bell will sound.

**NOTE:** *When any unit in the locomotive consist initiates an ALARM, the alarm bell on all locomotives will ring. All Dash 8 locomotives in the consist are notified of the ALARM through the SUMMARY message, "Alarm from Other Unit." If the initiating unit is a Dash 8 locomotive, a message describing the FAULT and "Silence" will appear on the Display Panel of that unit as described above. Pressing "Silence" on the initiating unit will quiet the ALARM on all trainlined units. The bell can only be silenced from the initiating unit therefore, "Silence" does not appear on any other units in the consist. See "Silence" soft key.*

### "Silence" Soft Key

"Silence" is the only soft key that appears in the ALARM mode. It does not appear in any other mode of operation.

When "Silence" is pressed OR if 30 seconds pass, the ALARM mode is terminated, the bell will stop ringing, the word "Silence" will disappear. The first line of the display will change from the FAULT message to show the operating restriction which has the greatest effect on the locomotive's ability to operate normally (highest priority SUMMARY message).

**NOTE:** *A few ALARMS are considered so serious that the bell cannot be silenced. In the cases of ENGINE SHUTDOWN, for example, no "Silence" soft key appears. The EC switch on the SHUTDOWN unit MUST be turned to the START position to silence the bell.*

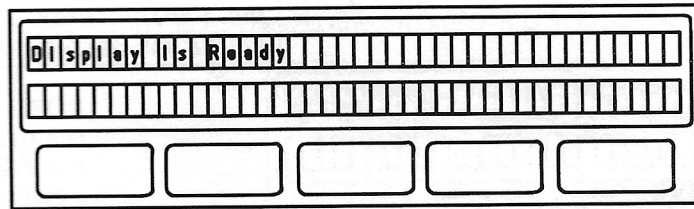
## FAULT Mode

As mentioned before, as a result of abnormal conditions (FAULTS), it may be necessary to protect the locomotive's equipment, by placing certain operating restrictions on the locomotive.



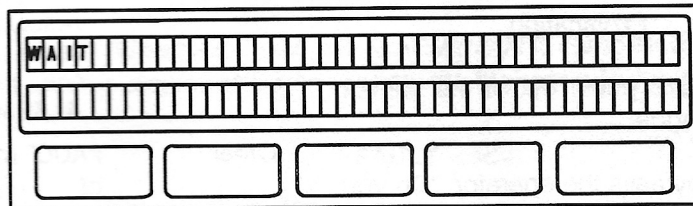
This Display indicates that the power was applied to the system and the DID panel is functioning.

**NOTE: This display will appear for 10 to 15 seconds while computers are starting.**

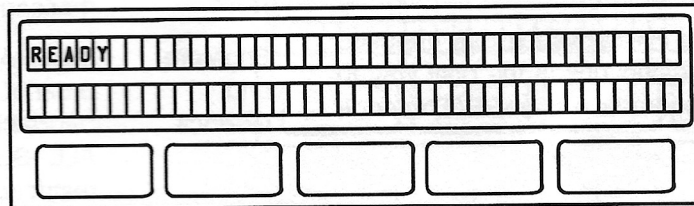


WAIT indicates that the CAB controller is starting to bring the control system "on-line" after power-up.

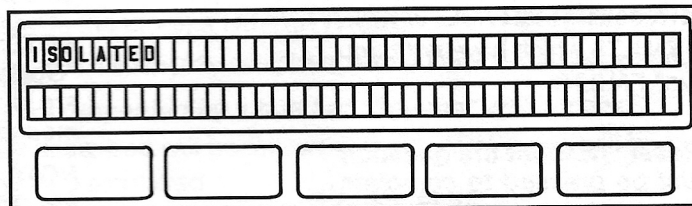
**NOTE: Display of the WAIT message longer than 30 seconds indicates that the CAB controller is not able to bring the control system "on-line" and a problem may exist.**



The READY display indicates all systems are running and the locomotive is READY to function normally.



This display indicates that the Engine Control (EC) switch is in the ISOLATED position.



The FAULT mode of operation allows the operator to return the locomotive to the READY condition unless conditions exist that prohibit READY operation.

The restrictions imposed are displayed in the form of SUMMARY messages. In resetting FAULTS it is important to know the following about SUMMARY messages:

1. If a FAULT is reset, the operating restrictions imposed by it are removed and the related SUMMARY messages are no longer displayed.

2. Several FAULTS may impose the same operating restrictions and will therefore, result in the same SUMMARY message.

**NOTE: A SUMMARY message will only be displayed once (by priority) regardless of the number of active FAULTS which generate the same message.**

3. A FAULT may result in more than one operating restriction and therefore, more than one SUMMARY message.

4. Under normal operating conditions, the highest priority SUMMARY message will be displayed. Highest priority being those conditions which have the greatest effect on the locomotive's ability to operate normally.
5. A list of SUMMARY messages by priority appears on Page 30.

## FAULT Mode Soft Keys

The following soft keys can be used by the operator to view SUMMARY and FAULT messages and to begin and to complete the reset procedure.

Soft Key Label	Explanation
Exit	Takes the DID panel out of the current operating mode.
Reset?	<p>This soft key asks the operator, "Do you want to Reset?" (a FAULT). It can only appear when there are Active FAULTS that can be reset by the locomotive crew.</p> <p>Resetting a FAULT which has imposed operating restrictions is the only way to return the locomotive to the READY condition.</p> <p>Resetting a FAULT requires two steps: Pressing "Reset?" <b>initiates</b> the reset procedure. When "Reset?" is pressed, the most recent FAULT will be displayed with the choice of resetting that FAULT or looking at other FAULTS which have not been reset ("Active" FAULTS).</p> <p><b>NOTE: "Reset" (without the question mark) must be pressed to complete the reset procedure.</b></p>
Reset	Pressing this key <b>completes</b> the reset procedure. Pressing "Reset" tells the computer this FAULT has been corrected, to remove all operating restrictions imposed by it and, if there are no other Active FAULTS, to return the locomotive to normal operation. When <b>all</b> Active FAULTS have been reset, the message "READY - Work Report Stored" will be displayed. If other Active FAULTS remain, the highest priority SUMMARY message

will be displayed.

**CAUTION: Equipment damage may result - If a FAULT reoccurs soon after being reset, the operator should NOT attempt to reset the FAULT more than THREE TIMES until the cause of the FAULT has been determined and corrected.**

**NOTE: If a FAULT causes power to be removed, the unit may not load after the FAULT is reset until the call for power is removed and again requested. This is done by momentarily placing the Engine Control (EC) switch in the ISOLATED position.**

**NOTE: If a FAULT is already Active (not reset), it will not reoccur. If a FAULT is reset and the problem not corrected, the FAULT will reoccur and the ALARM mode will be re-initiated.**

Older  
and  
Newer

FAULT messages are displayed in order of **most recent** first. The "Older" and "Newer" soft keys allow the operator to view "Older" and "Newer" Active FAULT messages respectively.

ShoMore  
and  
GoBack

SUMMARY messages are displayed in order of **highest priority**. "ShoMore" and "GoBack" allow the operator to review ALL SUMMARY messages (operating restrictions). Each time "ShoMore" is pressed, the next lower priority SUMMARY message will be displayed. Pressing "GoBack" will display the next higher priority SUMMARY message.

**NOTE: The choices "ShoMore" and "GoBack" are given only when there are lower or higher priority SUMMARY messages respectively.**

**NOTE: If there is no key pad activity for 15 seconds, the display will change to show the highest priority SUMMARY message.**

## Reset

Press "**Reset**" to clear the FAULT.

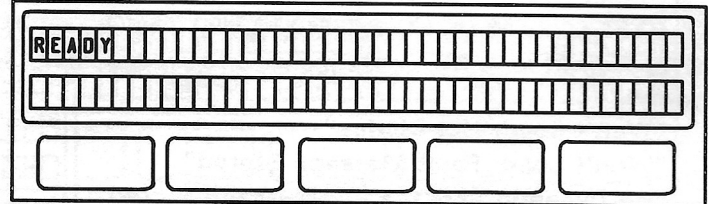
Several things happen when a FAULT is reset:

1. All operating restrictions imposed by the FAULT are removed.
2. If there are other Active FAULTS, the display will show the highest priority SUMMARY message of the remaining Active FAULTS.

## EXAMPLE – LEVEL 1 OPERATION

**NOTE:** The following example is intended to demonstrate DID operation, rather than show actual locomotive operating circumstances.

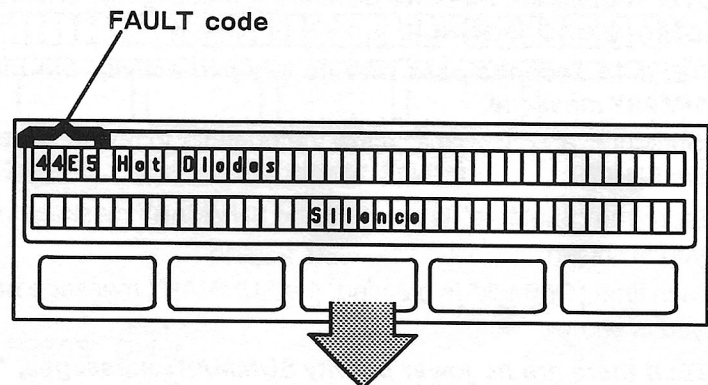
Let us assume, for example, that READY is displayed (the locomotive is in the READY mode).



A hot diode condition in the main rectifiers (a FAULT) is detected and the ALARM mode is initiated.

The display will change to show the FAULT, the word "Silence" will appear, and in this case, the alarm bell will ring.

When "Silence" is pressed OR after 30 seconds pass, the ALARM mode is completed; the bell stops ringing, the word "Silence" disappears and the display changes to show the **highest priority SUMMARY** message.



See FAULT MODE

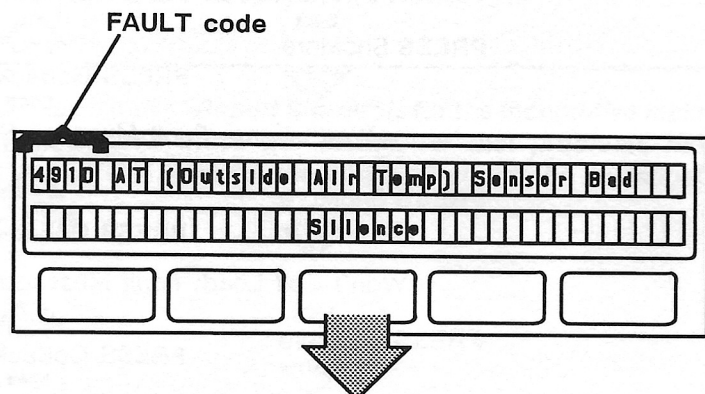
## Second Alarm

Next, let us assume that a bad outside air temperature sensor is detected. This FAULT occurred after the hot diode FAULT previously discussed and is therefore, a NEWER FAULT.

The ALARM mode is initiated and the display will change to show the bad temperature sensor FAULT.

**NOTE:** This FAULT is not accompanied by a bell but "Silence" will appear.

The procedure as previously described will be followed, the ALARM mode will be completed and the highest priority SUMMARY message will be displayed.



See FAULT MODE



## FAULT Mode

The highest priority SUMMARY message is now displayed. "Won't Load: Hot Diodes" is the highest priority operating restriction placed on the locomotive as a result of the hot diode FAULT and the "Air Temperature Sensor Bad" FAULTS. The operator now has two choices:

1. Press "Reset?" which will initiate the reset procedure, or
2. Press "ShoMore" to view all operating restrictions placed on the locomotive.

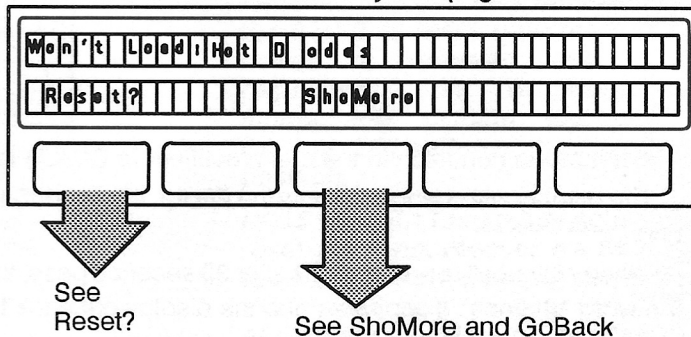
**NOTE: Four SUMMARY messages result from the "44E5 Hot Diodes" FAULT. They are (highest to lowest priority):**

"Won't Load: Hot Diodes"

"Won't Load: Fault Message Stored"

"No Dynamic Brake: Fault Message Stored."

"Won't Self-Load: Fault Message Stored"



**NOTE: If there are no other SUMMARY Messages, "ShoMore" will not appear.**

### ShoMore and GoBack

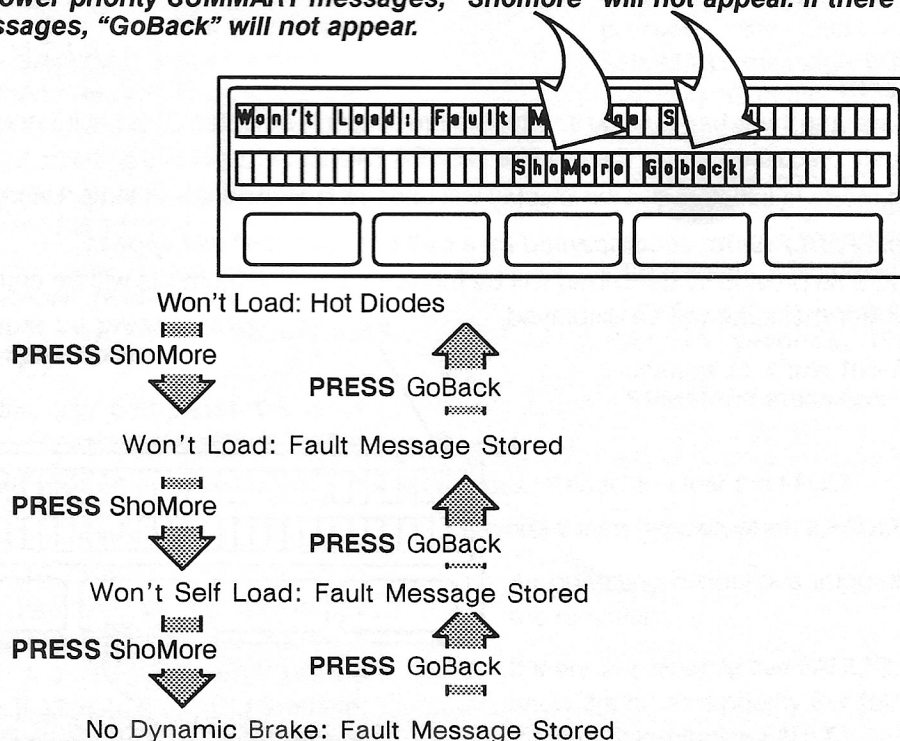
**NOTE: If 15 seconds pass with no key pad activity, the display will change to show the highest priority SUMMARY message.**

"ShoMore" and "GoBack" allow the operator to review all restrictions placed on the locomotive as a result of Active FAULTS.

Each time "ShoMore" is pressed, the SUMMARY message **next lower** in priority to the message currently displayed is shown.

Each time "GoBack" is pressed, the SUMMARY message **next higher** in priority to the message currently displayed is shown.

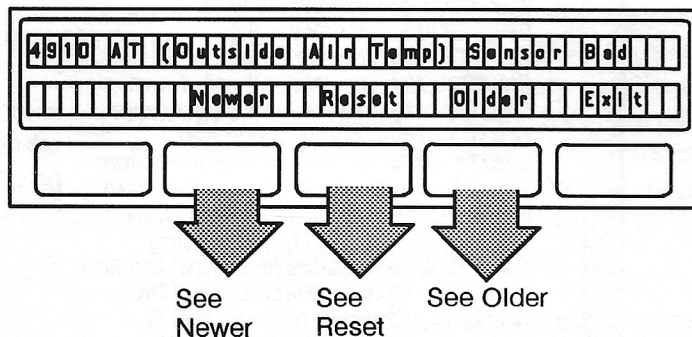
**NOTE: If there are no lower priority SUMMARY messages, "Shomore" will not appear. If there are no higher priority SUMMARY messages, "GoBack" will not appear.**



## Reset?

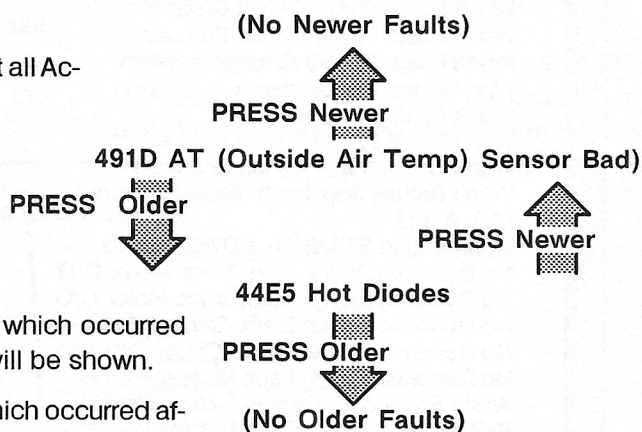
"Reset?" is the first step in the FAULT reset procedure.

When "Reset?" is pressed, the most recent (newest) FAULT message is displayed.



## Older or Newer

"Newer" and "Older" allow the operator to look at all Active FAULTS and to select the FAULT to be reset.



Each time "Older" is pressed, the FAULT which occurred previous to the FAULT currently displayed will be shown.

Each time "Newer" is pressed, the FAULT which occurred after the FAULT currently displayed will be shown.

**NOTE:** If there are no older FAULTS and "Older" is pressed, the message "(No Older Faults)" will appear. If there are no newer FAULTS and "Newer" is pressed, the message "(No Newer Faults)" will appear.

- If there are NO OTHER Active FAULTS, the display will change to show: "READY - Work Report Stored."

**NOTE:** The SUMMARY message "READY - Work

**Report Stored" is for the locomotive maintainer. It tells the maintainer that problems have been encountered which should be investigated.**

## LIST OF SUMMARY MESSAGES

Highest  
PriorityLowest  
Priority

WAIT  
 WARNING! Air Compressor Does Not Pump  
 WARNING! AC Exhauster Does Not Pump  
 Won't Load: Locked Axle Detected  
 Automatic Water Drain Disabled  
 SHUTDOWN: Low Water Flow  
 SHUTDOWN: Low Oil Pressure  
 SHUTDOWN: Low Water Pressure  
 SHUTDOWN: Crankcase Overpressure  
 SHUTDOWN: Engine Overspeed  
 SHUTDOWN: Electrical Control Problem  
 Won't Crank: Electrical Control Problem  
 Engine Not Running  
 Can't Load Now: Too Much Cycling  
 Can't Charge Batteries Now: BRP Cycling  
 No Battery Charge: Elect. Control Prob.  
 No Battery Charge  
 Won't Battery Jog: Elect. Control Prob.  
 Can't Battery Jog: BKT in Wrong Position  
 Can't Self-Load: REV in Wrong Position  
 Won't Load: Overspeed Governor Problem  
 Won't Load: Aux. Alternator Field C/O  
 Won't Load: Side Door Open  
 Won't Load: Electrical Control Problem  
 Won't Load: Too Many Speed Sensors C/O  
 Won't Load: Waiting for Aux. Alternator  
 Won't Load: Hot Engine  
 Won't Load: Power Circuit Ground  
 Won't Load: Power Circuit Problem  
 Won't Load: Battery Charge Problem  
 Won't Load: Hot Diodes  
 Won't Load: MU Error  
 Won't Load: Fault Message Stored  
 Won't Crank: Fault Message Stored  
 Won't Battery Jog: Fault Message Stored  
 ISOLATED  
 Operating in STANDBY POWER Mode  
 No Dynamic Brake: Man. Tract. Motor C/O  
 No Dynamic Brake: Auto. Tract. Motor C/O  
 No Dynamic Brake: Elect. Control Prob.  
 No Dynamic Brake: Power Circuit Problem  
 No Dynamic Brake: Fault Message Stored  
 Won't Self-Load: Fault Message Stored  
 Self-Load: LOAD CONDITIONS  
 Warning: Locked Axle Alarm is Cut Out  
 Load Limited: PLS in Notch 7  
 Load Limited: T/L 13 or T/L 16 Open  
 Load Limited: Low Oil Pressure  
 Load Limited: Low Water Pressure  
 Load Limited: Hot Engine  
 Load Limited: Cold Engine  
 Load Limited: Dirty Engine Air Filter  
 Load Limited: Traction Motors Cut Out  
 Load Limited: Trac. Motor Temp. Protection  
 Load Limited: Power Circuit Ground  
 Load Limited: Electrical Control Problem  
 May Reduce Load: Radiator Fan Cycling  
 May Reduce Load: Radiator Fan Problem  
 Please Initialize CAB Via Toolbox  
 Alarm From Other Unit  
 Fault Log is Almost Full  
 READY - Fault Message Stored  
 READY - Work Report Stored  
 READY



## AIR BRAKE EQUIPMENT

The Schedule 26-L equipment, arranged for single-end, multiple-unit operation, is used on this locomotive. The principal parts are as follows:

### AIR BRAKE EQUIPMENT IN AIR BRAKE COMPARTMENT

See Fig. 18 for location of equipment in the air brake compartment. Presence of equipment will depend on the options selected by a railroad. See the Air Piping Diagram for specific air brake valve locations.

### BRAKE VALVE (FIG. 16)

#### Automatic Brake Valve Handle

This brake valve handle operates through six detented control positions: RELEASE, MINIMUM REDUCTION, FULL SERVICE, SUPPRESSION, HANDLE OFF, and EMERGENCY. The service zone is between minimum reduction and full service positions. An indicating plate is provided indicating the six operating positions.

When charging a train or releasing an Automatic brake application, the automatic brake valve handle should be placed in RELEASE (running) position, which is the position closest to the engineer.

When making a Service brake application, move the automatic brake valve handle away from the engineer against the first raised portion on the quadrant. This is a minimum reduction position which will provide a 5-1/2 to 7 psi reduction. If necessary to increase the reduction, move the handle progressively away from the engineer, bearing in mind that the further the handle is moved into the service zone, the greater will be the reduction. The brake valve will self-lap at any point where movement of handle is stopped in the service zone and automatically maintain any brake pipe leakage.

A Full Service brake application is obtained by moving the brake valve handle to the B.V. FULL SERVICE position (against the second raised portion on the quadrant).

**WARNING: To ensure safe consist operation, follow specific Railroad precautions for securing Trail or Dead units.**

An Emergency brake application is obtained by moving the brake valve handle to the extreme rear of the quadrant, which is EMERGENCY position.

The automatic brake valve handle should be moved to HANDLE-OFF position when the locomotive is a trailing unit in a multiple-unit consist or is being towed DEAD.

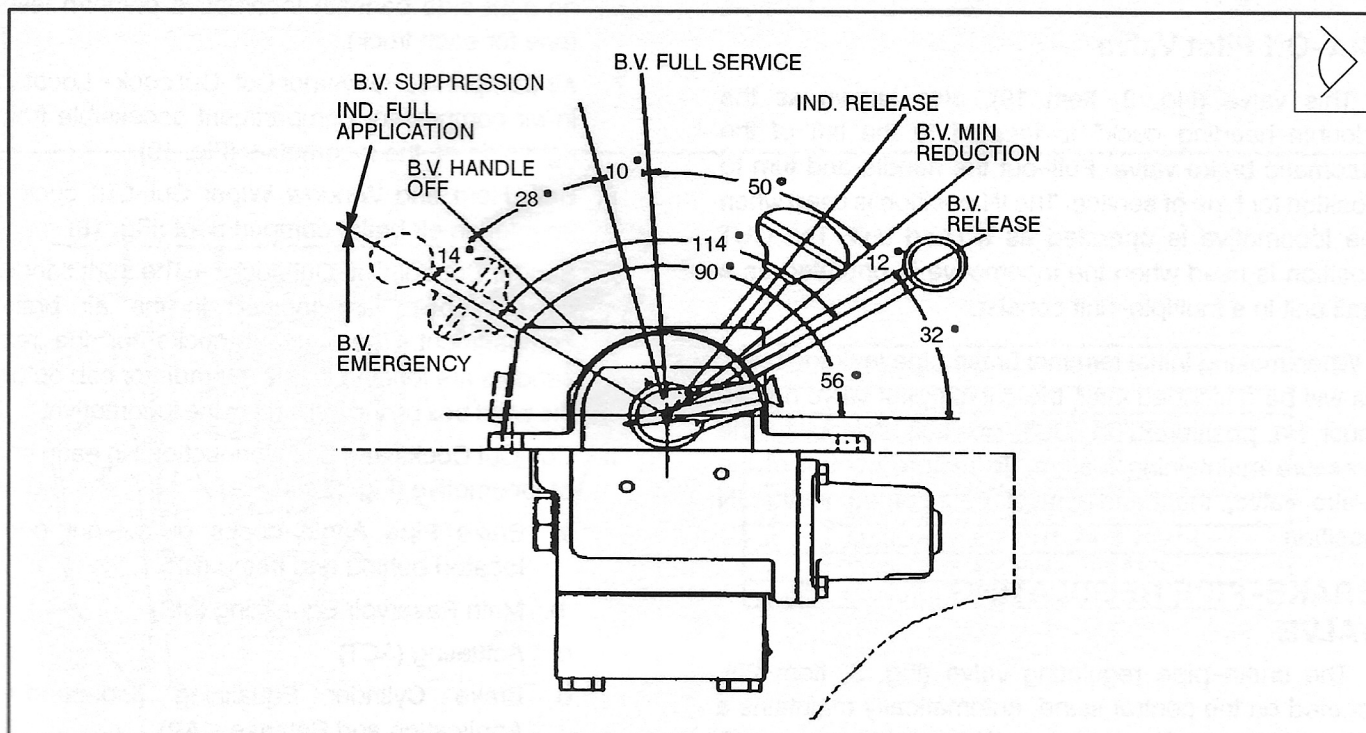


FIG. 16. BRAKE VALVE, HANDLE POSITIONS. E-37702B.

## Independent Brake Valve Handle

**NOTE:** *If independent brake is applied, dynamic braking effort is decreased depending on locomotive speed, see DYNAMIC BRAKE OPERATION, Use of Air Brakes During Dynamic Braking on Page 62.*

When applying the locomotive independent brake with the independent brake valve, move the independent handle away from the engineer (Full Independent application – extreme rear position), and when releasing, move the handle toward the engineer. The brake valve will self-lap at any point in the application zone where handle movement has been stopped.

To make an independent release of an Automatic brake application, move the independent brake valve handle to the right (away from the indicating plate).

**WARNING:** *To ensure safe consist operation, follow specific Railroad precautions for securing Trail or Dead units.*

The independent brake valve handle should always be in RELEASE position (extreme forward) when the unit is a trailing unit in a multiple-unit consist or is being towed DEAD.

## Cut-Off Pilot Valve

This valve (Fig. 3, Item 19), also known as the “double-heading cock” is located to the left of the automatic brake valve. Pull-out the handle and turn to position for type of service. The IN position is used when the locomotive is operated as a Lead unit. The OUT position is used when the locomotive is operated as a Trail unit in a multiple-unit consist.

When making initial terminal brake pipe leakage tests, as will be described later, the cut-off pilot valve handle must be positioned in OUT position, to nullify the pressure maintaining feature. To restore control of the brake valve, the handle must be returned to the IN position.

## BRAKE-PIPE REGULATING VALVE

The brake-pipe regulating valve (Fig. 3, Item 20), located on the control stand, automatically maintains a predetermined air pressure in the equalizing reservoir and brake-pipe system. A clockwise movement of the adjusting handle increases the pressure setting. A

counterclockwise movement decreases the pressure setting. Adjust to conform with railroad regulations.

## AIR COMPRESSOR SAFETY VALVES

This valve is located in the piping to the first main reservoir. It is set to open at 150 psi (1033,5 kPa). An optional safety valve is located at the air outlet of the air compressor and is set to operate at 175 psi (1205,8 kPa).

## CUT-OUT COCKS

At specified inspection or maintenance periods, the following manually operated devices are used:

1. Main Reservoir Cut-Out cock – Located on right side of locomotive near the main reservoir (Fig. 17).
2. Main Reservoir Drain cocks – One located on the end of each main reservoir, usually part of automatic drain valves.
3. Air Filter Drain cocks – Located on the main reservoir and auxiliary air filters.
4. Control Air Cut-Out cock – Located in air brake compartment (Fig. 18, Item 14).
5. Control Air Reservoir Drain cock – Located in air brake compartment on rear wall.
6. Truck (Brake Cylinder) Cut-Out cocks – Located on right side beneath locomotive platform level (one for each truck).
7. Air Compressor Governor Cut-Out cock – Located in air compressor compartment accessible from right side of the locomotive (Fig. 19).
8. Bell, Horn and Window Wiper Cut-Out cock – Located in air brake compartment (Fig. 18).
9. Sander Control Cut-Out cocks – The front sander cut-out cocks are located in the air brake compartment. The cut-out cocks for the rear sanders are located inside the radiator cab below the sand box on the left side of the locomotive.
10. Cut-Out Cocks and End Connections in each end of locomotive (Fig. 20) :
  - a. Brake Pipe Angle cocks or cut-out cock located behind end frame (BP)
  - b. Main Reservoir Equalizing (MR)
  - c. Actuating (ACT)
  - d. Brake Cylinder Equalizing (Independent Application and Release – AP).
11. Safety Control Cut-Out cock – Located in air brake compartment. Cuts out safety control feature when

closed. (See Air Piping Diagram for inclusion and specific location.)

12. Dead Engine cock - Located in air brake compartment (Fig. 18).

## ADJUSTING VALVES

### Control Air Reducing Valve (Located in Control Area 7, Fig. 26)

This valve maintains a predetermined normal air pressure in the air pressure supply for operation of pneumatically operated control equipment. Clockwise adjustment of the adjusting screw increases pressure. Normal control air pressure is 80 lb.

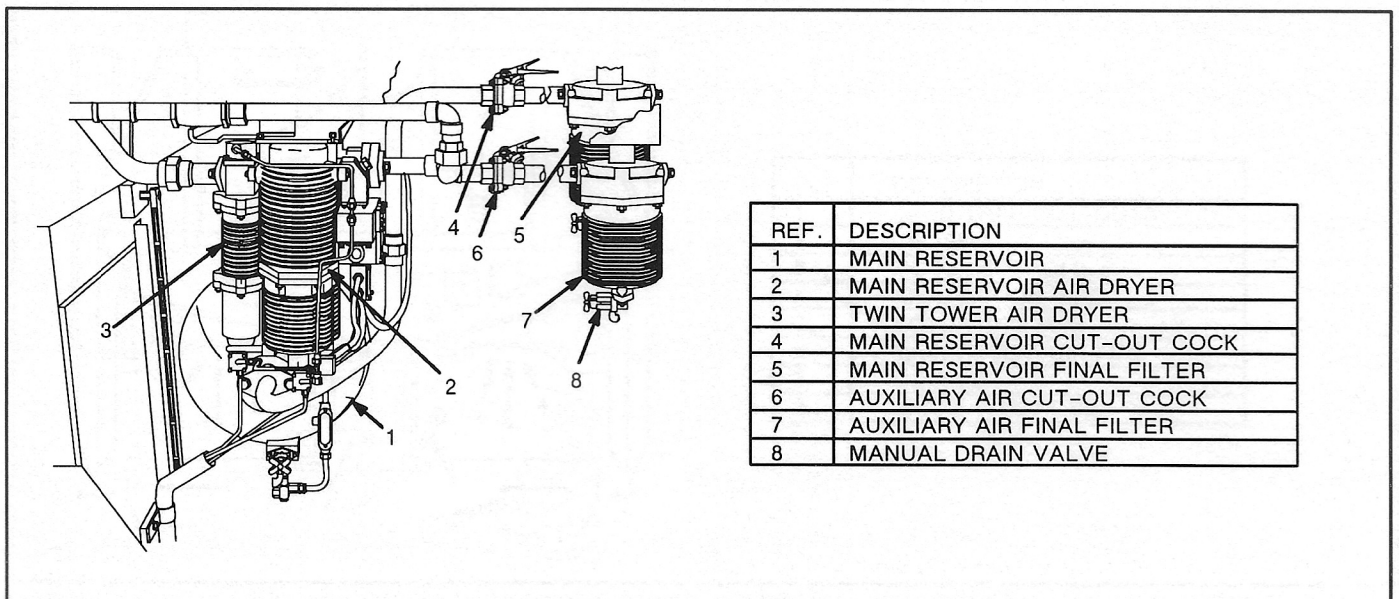
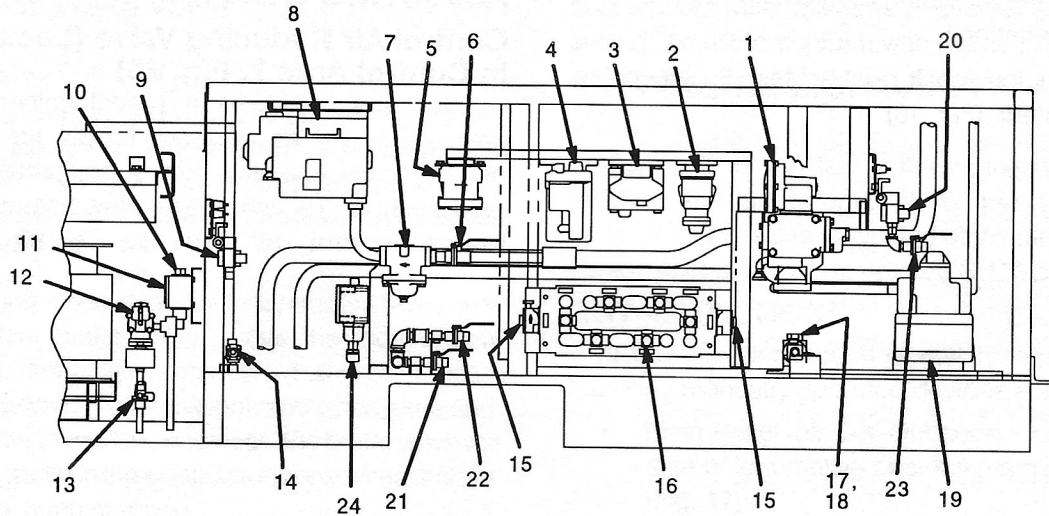


FIG. 17. MAIN RESERVOIR CUT-OUT COCK, MAIN AND AUXILIARY FILTERS AND DRAINS (TYP.). E-39051.





REF.	DESCRIPTION	REF.	DESCRIPTION
1	BRAKE VALVE (30A-CDW)	13	CONTROL AIR CUT-OUT COCK (VENTED)
2	RELAYAIR VALVE (H-5, 60 LB)	14	CONTROL AIR DRAIN CUT-OUT COCK
3	A-1 VALVE (CHARGING CUTOFF)	15	CHECK VALVE
4	P2A APPLICATION VALVE	16	DOUBLE CHECK VALVES
5	DRAIN LINE AIR FILTER	17	DEAD ENGINE CHECK VALVE AND STRAINER
6	BRAKE-PIPE AIR CUT-OUT COCK	18	DEAD ENGINE CUT-OUT COCK
7	BRAKE-PIPE AIR FILTER	19	RELAY VALVE (J1.6-16)
8	26-F CONTROL VALVE	20	MAGNET VALVE (AMV)
9	DYNAMIC BRAKE MAGNETIC VALVE	21	FLANGE LUBE AIR CUT-OUT COCK
10	IBS PRESSURE SWITCH	22	BELL AIR CUT-OUT COCK
11	PRESSURE SWITCHES (PCS, DBCO, SPS)	23	CUT-OUT COCK
12	HORN MAGNET VALVE	24	PRESSURE SWITCH (BELL)

FIG. 18. AIR BRAKE EQUIPMENT LOCATIONS. E-39928.

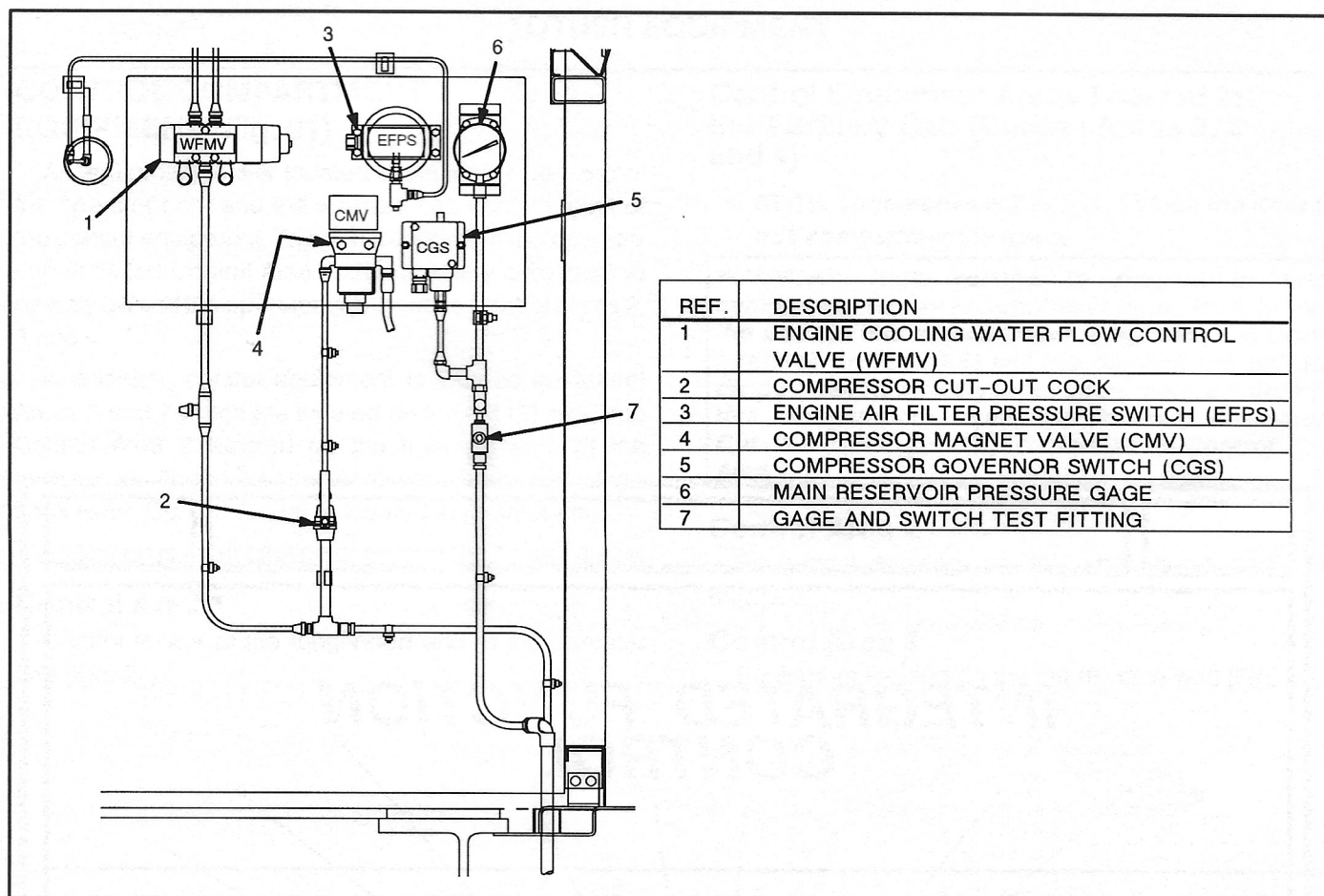


FIG. 19. AIR COMPRESSOR CONTROL PANEL, ENGINE AIR FILTER PRESSURE SWITCH AND ENGINE COOLING WATER FLOW CONTROL VALVE AND PRESSURE REGULATOR. E-34091A.

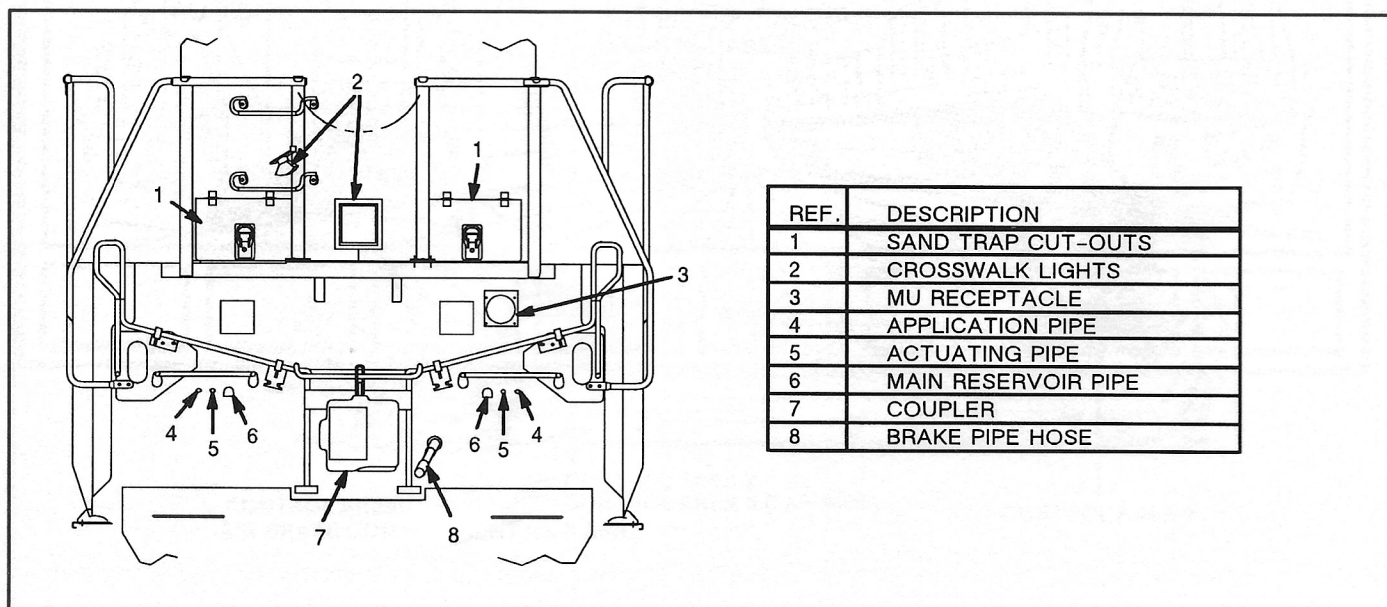
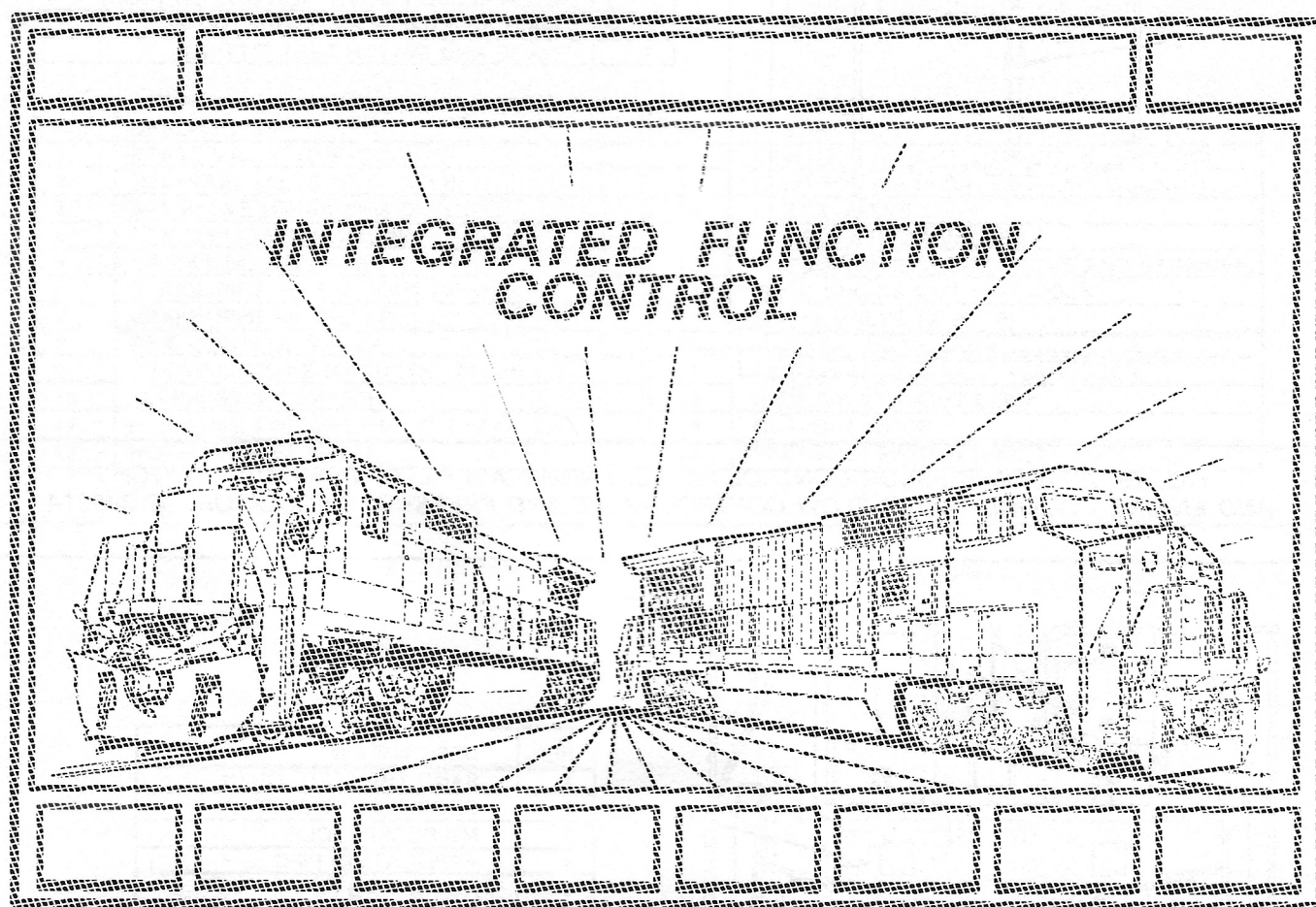


FIG. 20. AIR BRAKE END CONNECTIONS (TYP.). E-31319C.





## OTHER EQUIPMENT

### CONTROL COMPARTMENT EQUIPMENT (Fig. 21)

An equipment locker located at the long-hood end of the operator cab, and the auxiliary cab contain most of the control equipment. The control locker in the operator cab is called Control Area 1. The auxiliary cab, located directly behind the operator cab, houses Control Areas 2, 3 and 4.

In addition, control equipment is located in Control Areas 6 and 7 which are located on the left (B) side and Control Area 8 located on the right (A) side of the locomotive. These Control Areas are accessible from track level. Control Area 9 is located in radiator cab.

Following is a description of each of the control areas:

#### Control Area 1

Control locker at the long-hood end of the operator cab (Fig. 22).

### Control Equipment Areas Located in the Auxiliary Cab (Control Areas 2, 3 and 4)

**NOTE:** Locomotive will not load when the door to this compartment is open.

**WARNING:** High voltage is present in this compartment when locomotive is under load. When the door to this compartment is opened, the Door Interlock Switch (DIS) will trip causing the unit to drop power. As a safety precaution, before entering this compartment, open the Auxiliary Alternator Cut-Out switch (BFCO) located inside Control Area 1.

#### Control Area 2

Equipment located on the short-hood end wall (Fig. 23).

#### Control Area 3

Equipment located on the left (B) side wall (Fig. 24).

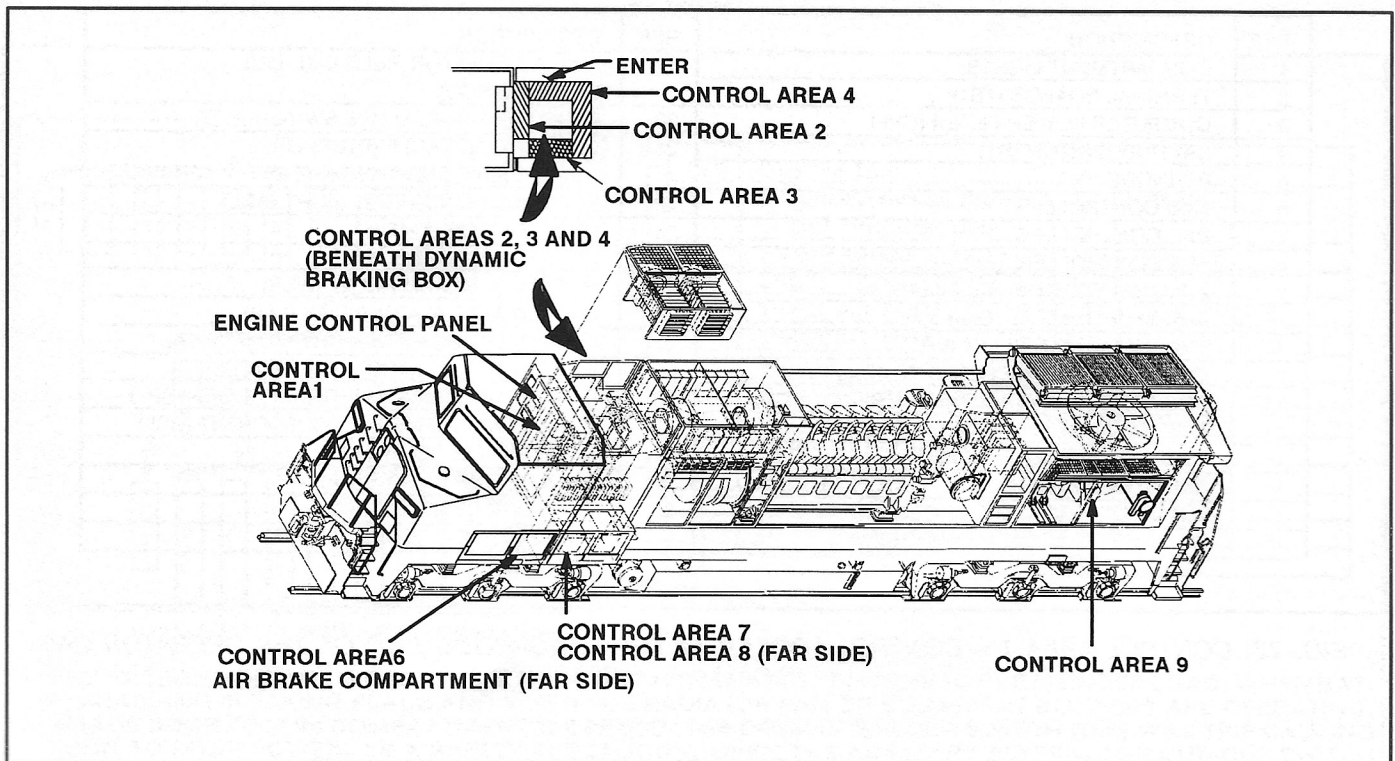
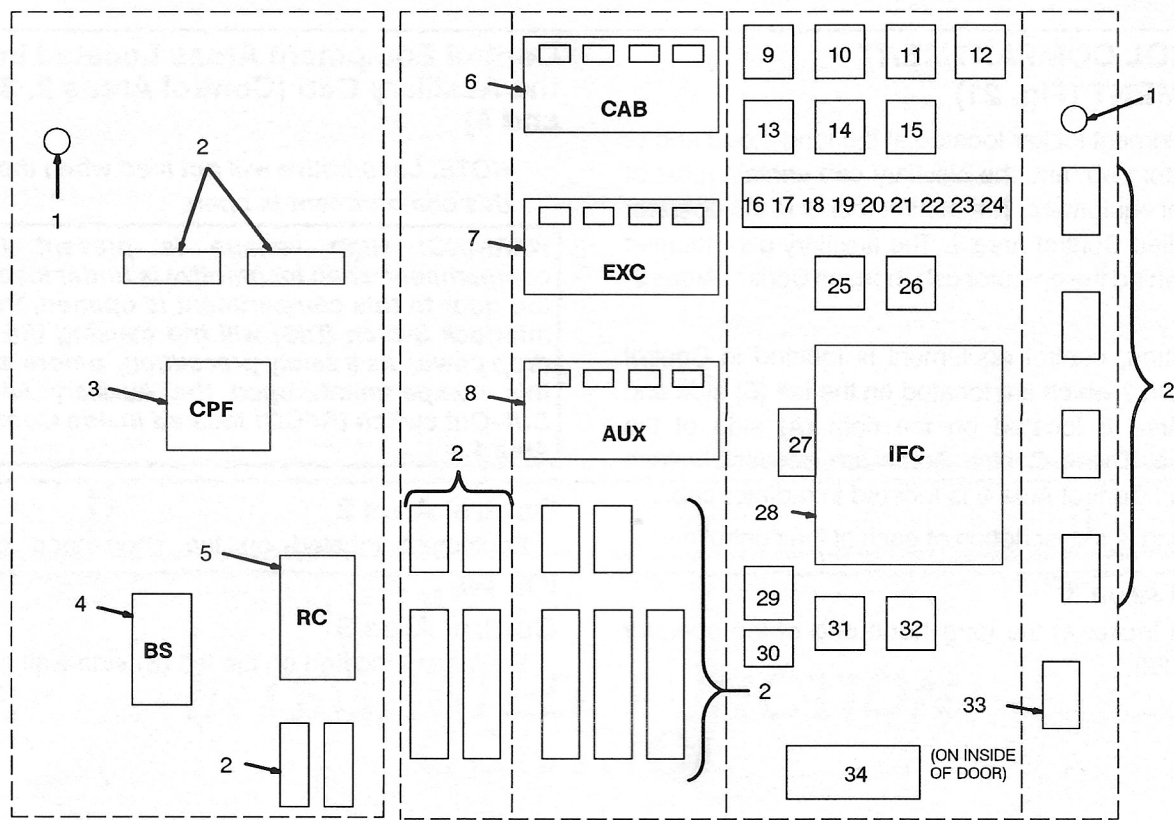


FIG. 21. LOCATION OF CONTROL AREAS. E-38382.



REF.	DESCRIPTION	REF.	DESCRIPTION
1	COMPARTMENT LIGHTS	19	AUX. ALTERNATOR FIELD CUT-OUT SWITCH (BFCO)
2	TERMINAL BOARDS (TB1)	20	RADIATOR FAN REVERSE SWITCH (FRB)
3	COMPUTER POWER FILTER (CPF)	21	25-PIN RECEPTACLE (PTUR) OR HEATER/AIR CONDITIONER TEST SWITCH (HCTS)
4	BATTERY SWITCH (BS)	22	AIR CONDITIONER TEST LIGHT (ACL)
5	RC DIODE (RC)	23	LEVEL SWITCH (IDAS1)
6	CAB CONTROLLER	24	DID SWITCH (IDAS2)
7	EXC CONTROLLER	25	WHEELSLIP ALARM RELAY (WSR)
8	AUX CONTROLLER	26	LOCKED AXLE ALARM RELAY (LAR)
9	A,B,C SPEED VALVE RELAY (ABCR)	27	PERMANENT CORE MEMORY (PCM)
10	ALARM BELL RELAY (BLR)	28	INTEGRATED FUNCTION COMPUTER (IFC)
11	DYNAMIC BRAKE RELAY (BR1)	29	BAROMETRIC PRESSURE TRANSDUCER (BPT)
12	COMPRESSOR LINE RELAY (CRL)	30	EQUIPMENT BLOWER SENSOR, FRONT (BSF)
13	PNEUMATIC POWER CONTROL RELAY (PCR)	31	BATTERY JOG RELAY (JGR)
14	FUEL PUMP RELAY (FPR)	32	PACE SETTER RELAY (PSR)
15	DV SHUT-DOWN RELAY (DVR)	33	TRAINLINE RESISTOR PANEL (TRP)
16	SELF-LOAD BOX TOGGLE SWITCH (LBTS)	34	LOCOMOTIVE CAB UNIT (LCU)
17	LOAD BOX SELECTOR SWITCH (LBSS)		
18	DIAGNOSTIC ACCESS SWITCH (DAS)		

FIG. 22. CONTROL AREA 1 - CONTROL LOCKER AT THE LONG-HOOD END OF THE OPERATOR CAB (TYPICAL). E-40929A.

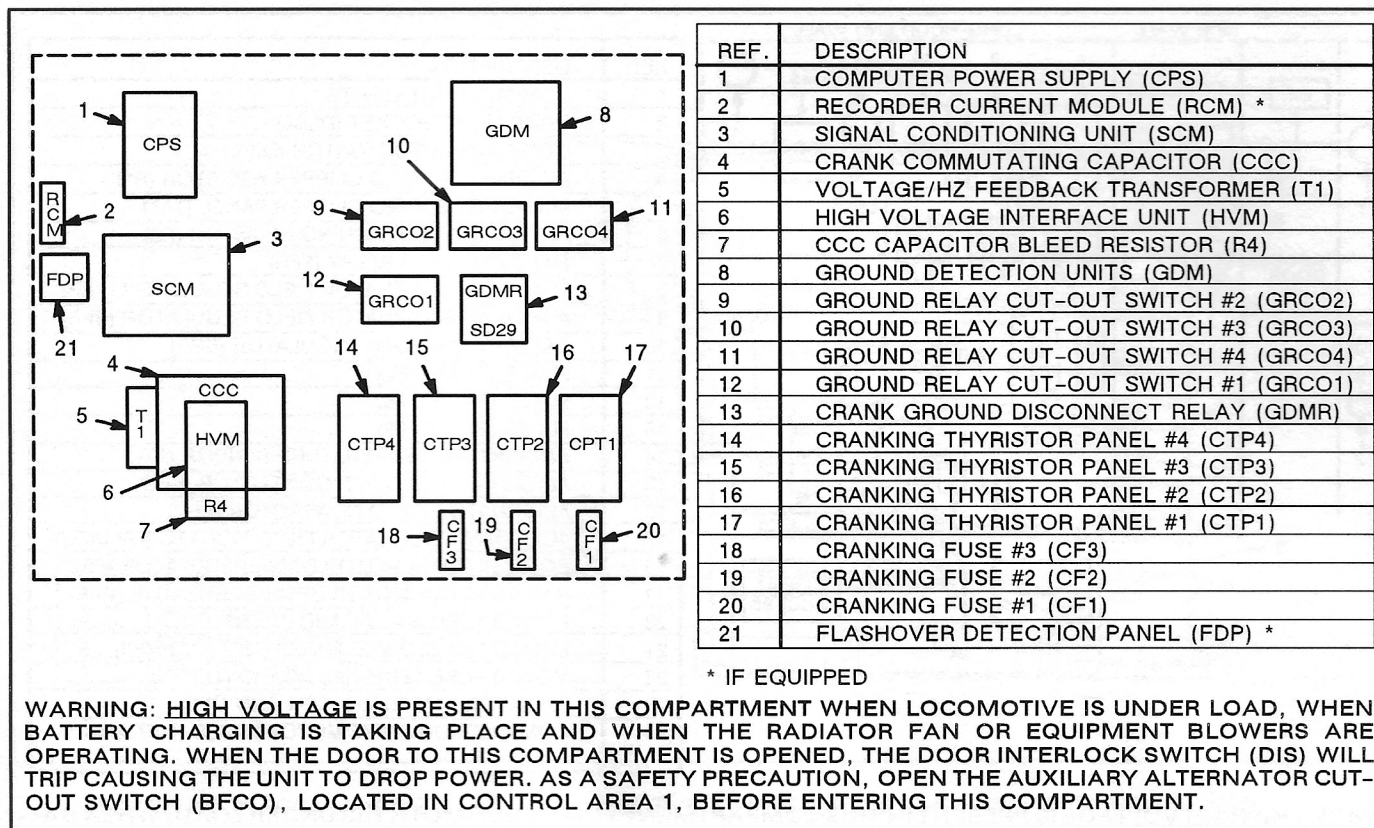


FIG. 23. CONTROL AREA 2 - EQUIPMENT LOCATED ON THE SHORT-HOOD END WALL (TYPICAL). E-34094D.

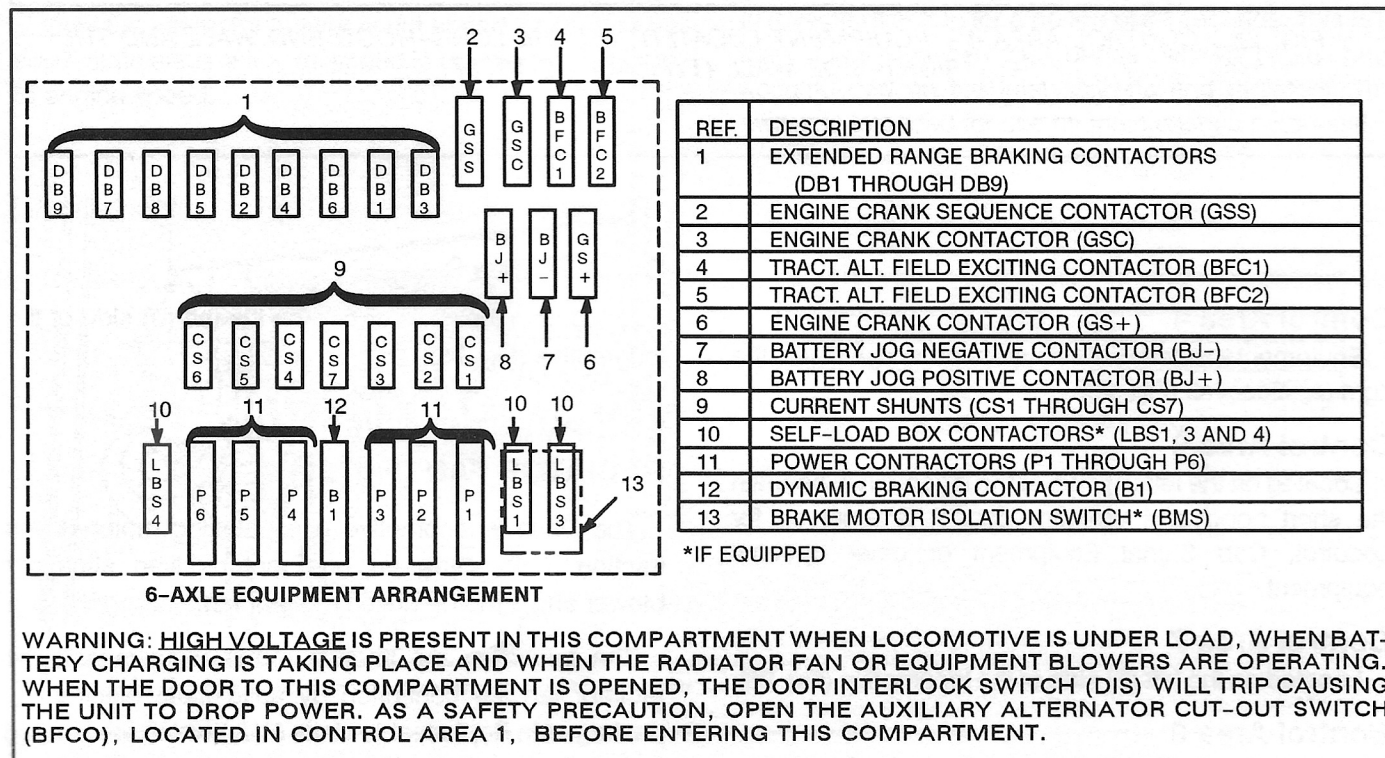


FIG. 24. CONTROL AREA 3 - EQUIPMENT LOCATED ON THE LEFT-SIDE WALL (TYPICAL). E-40930.



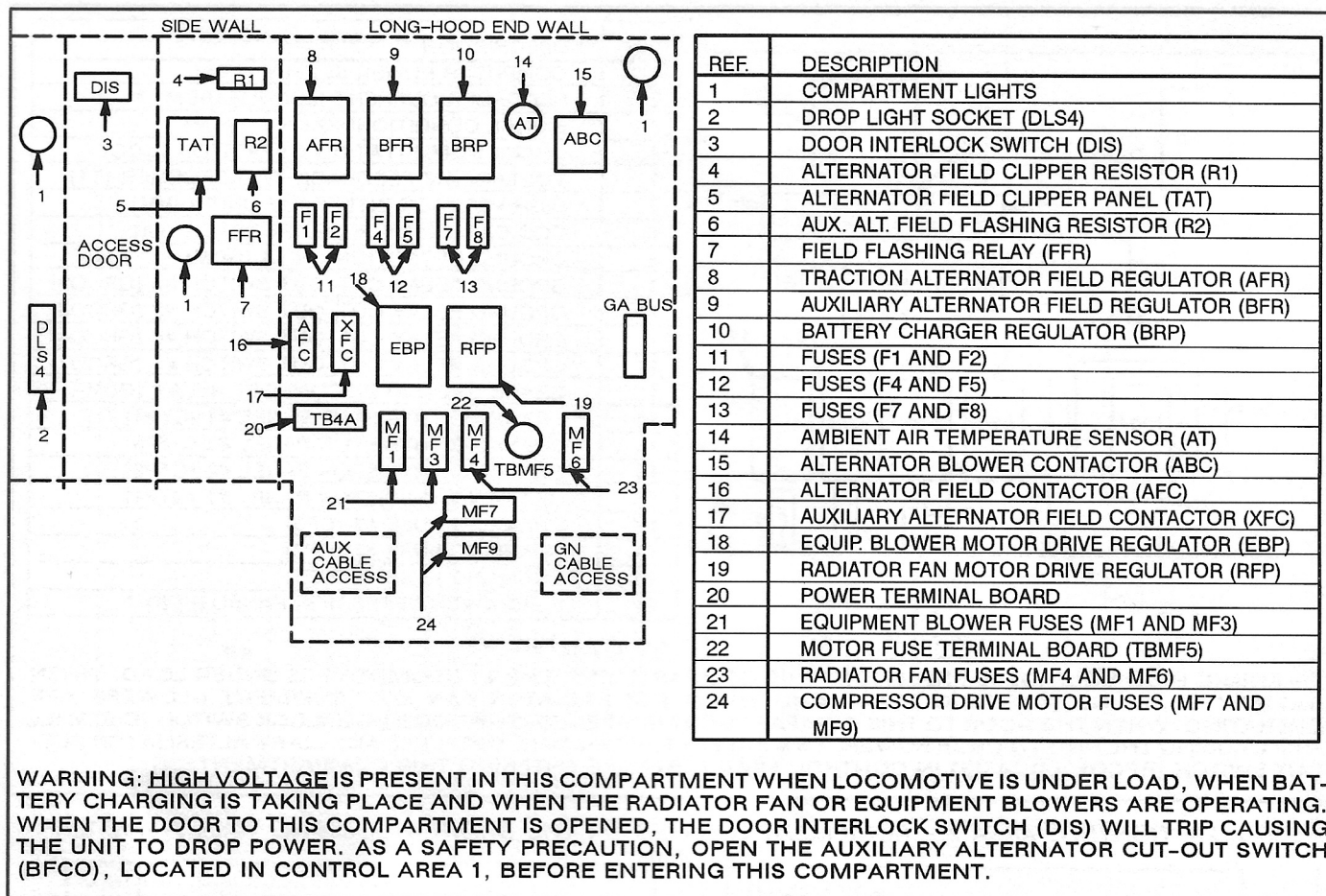


FIG. 25. CONTROL AREA 4 – EQUIPMENT LOCATED ON THE LONG-HOOD END WALL AND THE RIGHT-SIDE WALL (TYPICAL). E-39567.

### Control Area 4

Equipment located on the long-hood end wall and the right (A) side wall (Fig. 25).

### Control Area 6

Located on the left (B) side of the locomotive, beneath the short hood and operator cab. It is reserved for Locotrol, Cab Signal Equipment or other optional equipment.

### Control Area 7

Located on the left (B) side of the locomotive (Fig. 26).

### Control Area 8

Located on the right (A) side of the locomotive adjacent to the air brake compartment (Fig. 27).

### Control Area 9

Located in the radiator cab on the left (B) side of the locomotive (Fig. 28).

### EQUIPMENT BLOWERS AND RADIATOR FAN (Fig. 29)

The Dash 8 locomotive uses electric motor-driven traction motor blowers, one motor-driven alternator blower and a motor-driven radiator fan.

The speed of the traction motor blowers and the radiator fan are controlled by solid-state electronics, packaged in Replaceable Units (RUs) which are located in Control Area 4 (Fig. 25). This type of control reduces auxiliary loads on the diesel engine since the blowers

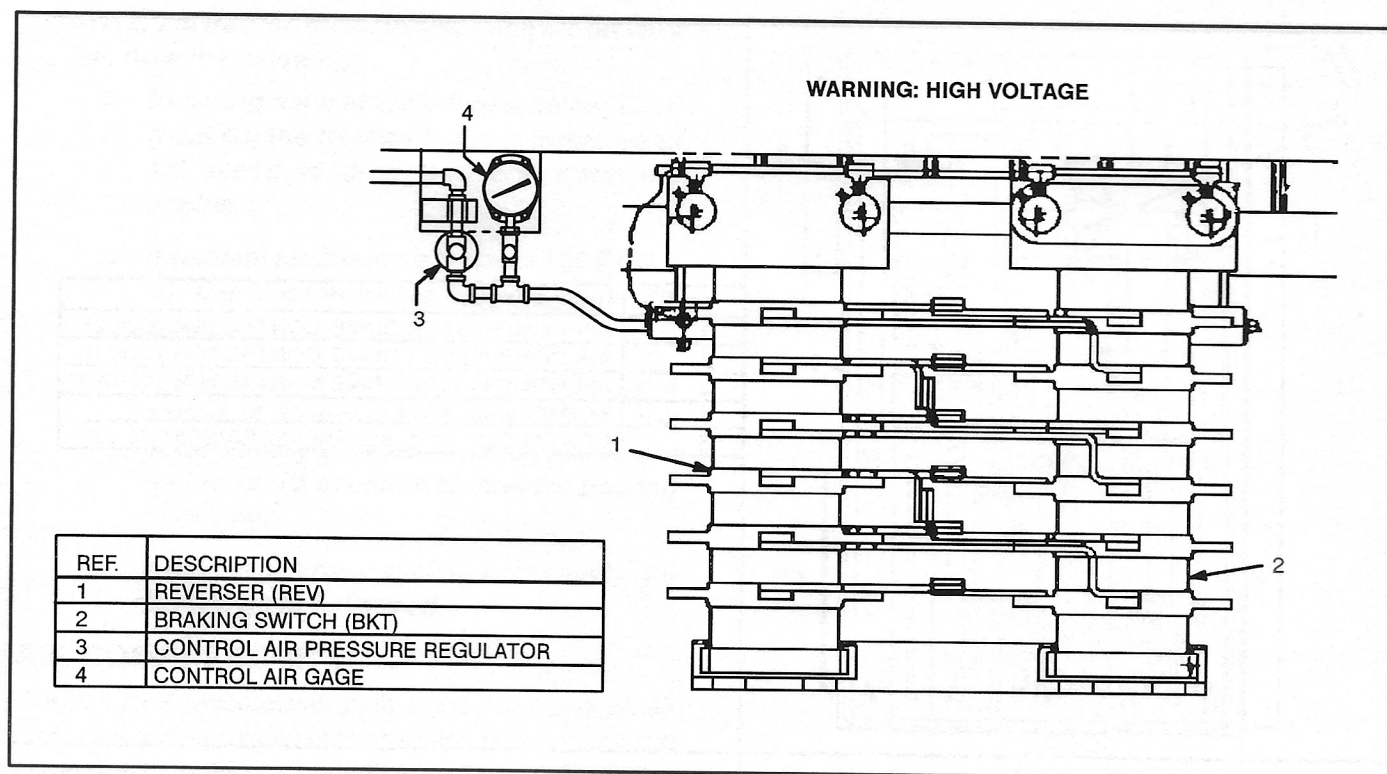


FIG. 26. CONTROL AREA 7 – LOCATED ON THE LEFT SIDE OF THE LOCOMOTIVE. E-40702.

and fan run only when cooling is required, thus saving fuel.

Only the alternator blower is not speed-controlled by solid-state electronics. Its speed is directly proportional to engine speed.

A Fan Reverse switch, located in Control Area 1 (Fig. 22, Item 20), can be used to operate the radiator fan in reverse direction for a period of 60 seconds. This is to help clear leaves and debris which could have accumulated on the inlet screens and radiators. This switch is intended for use by maintenance personnel.

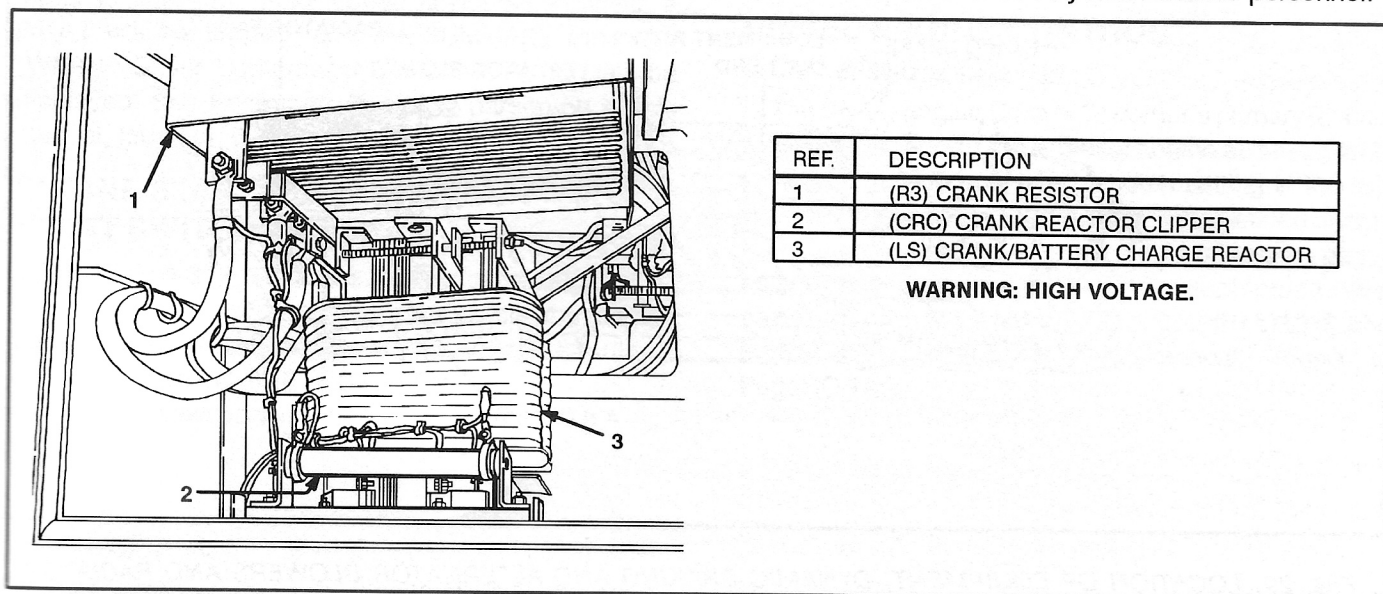


FIG. 27. CONTROL AREA 8 – LOCATED ON THE RIGHT SIDE OF THE LOCOMOTIVE ADJACENT TO THE AIR BRAKE COMPARTMENT. E-31359B.

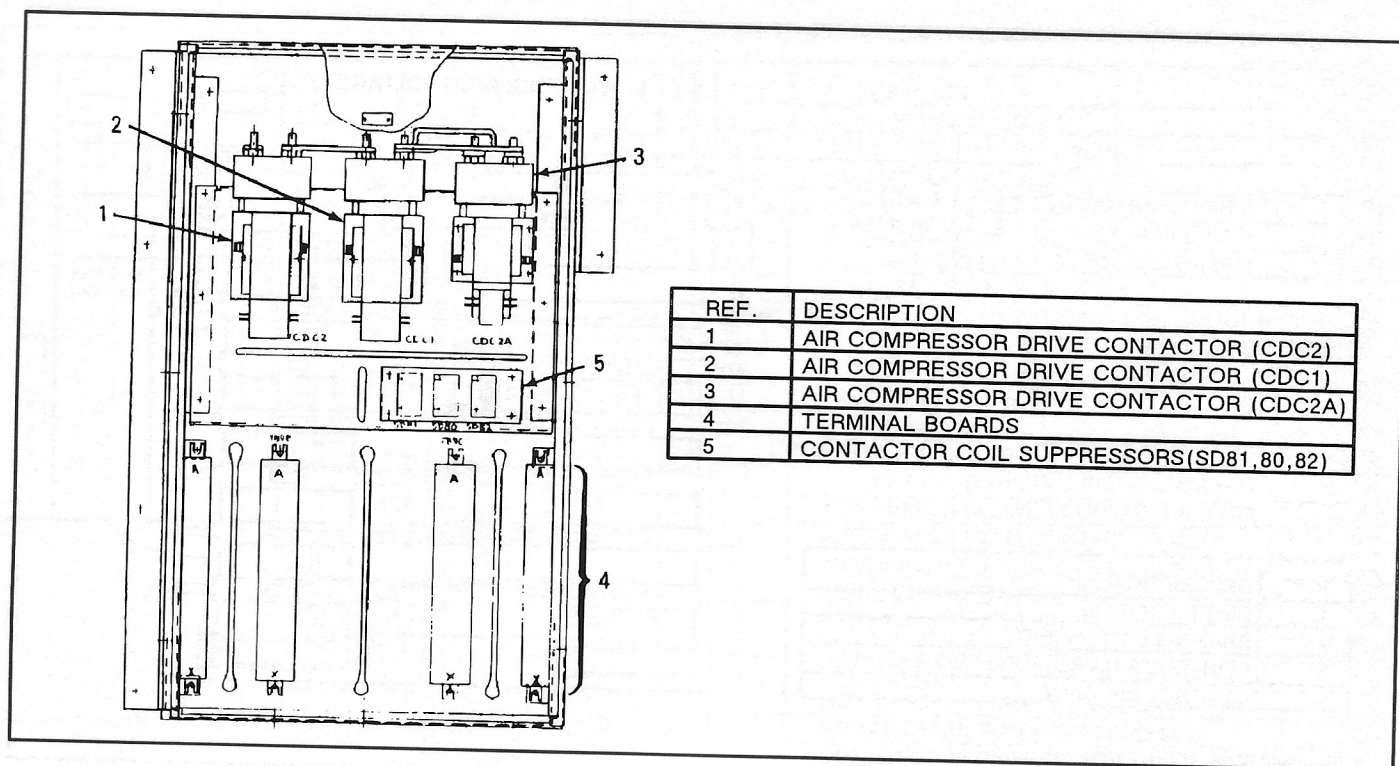


FIG. 28. CONTROL AREA 9 - LOCATED IN THE RADIATOR CAB ON THE LEFT SIDE OF THE LOCOMOTIVE. E-34098A.

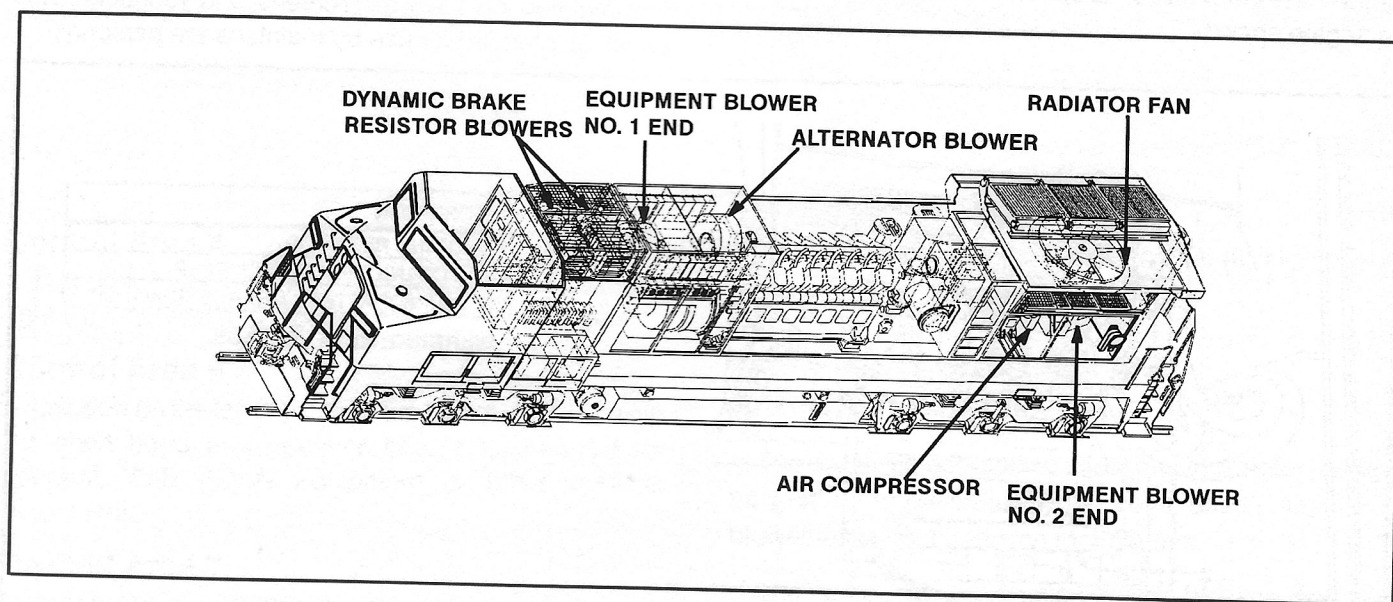


FIG. 29. LOCATION OF EQUIPMENT, DYNAMIC BRAKING AND ALTERNATOR BLOWERS AND RADIATOR CAB. E-38381.



**NOTE: For traction motor blowers and the radiator fan, note the following:**

1. If cooling water temperature is below 150 F (65.5 C), the traction motor blowers go to full speed to draw load and warm the engine.
2. If ambient temperature is above 130 F (54.5 C), the traction motor blowers go to full speed.
3. If the radiator fan is not operated for a period of 30 minutes, the controllers will automatically operate it at full speed for a period of 10 seconds to prevent bearing brinelling.
4. If the fan has been cycling excessively, the fan will go to full speed.

## AIR COMPRESSOR

All Dash 8 locomotives built since 1987 use an air compressor driven by an electric motor. Motor speed and compressor loading are controlled by the EXC Controller. The Compressor Governor Switch (CGS), located on the compressor control panel, monitors main reservoir pressure and provides a pressure signal to EXC. EXC, in turn, energizes the compressor drive contactor to start the air compressor drive motor. After two seconds, EXC de-energizes the Compressor Magnet Valve (CMV) to load the compressor. Speed of the air compressor drive motor is also monitored. If EXC has commanded the drive motor to start, but motor speed is not within limits, a FAULT will be logged, and the SUMMARY message "WARNING! Air Compressor Does Not Pump" will be displayed. See **Faster Air Pumping** paragraph of this manual, found on Page 60.

## ENGINE START STATION AND START SWITCH (Fig. 30)

The Engine Start Station is located in the engine cab next to the main traction alternator. It consists of an engine PRIME/START switch, which is used to start the diesel engine, and an ENGINE STOP button.

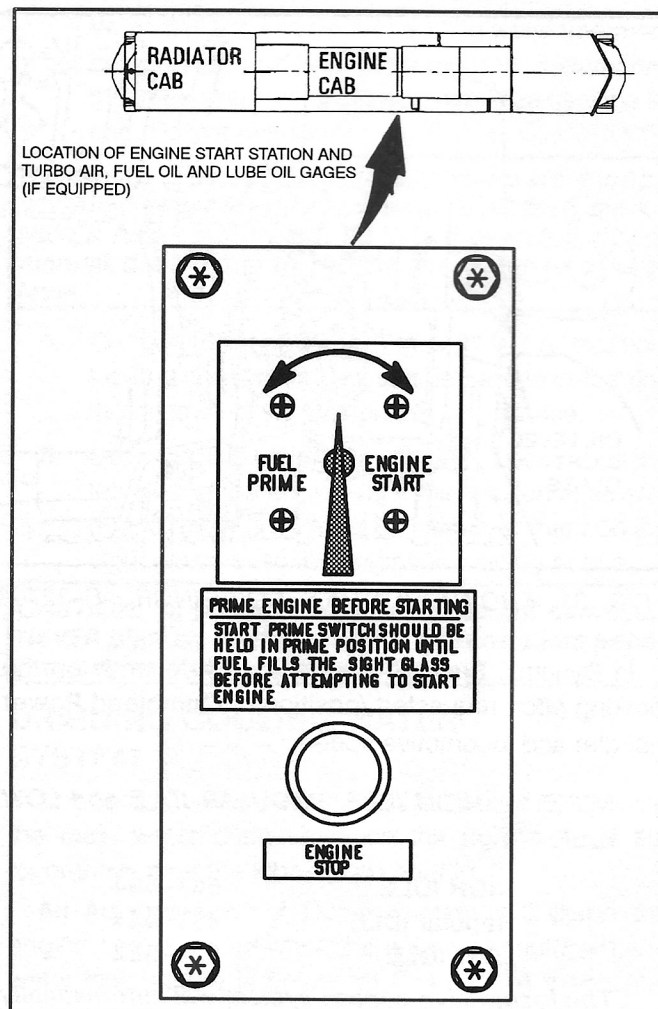


FIG. 30. ENGINE START STATION. E-39074.

## DIESEL ENGINE CONTROL GOVERNOR (Fig. 31)

The Diesel Engine Control Governor's primary function is to maintain speed of the diesel engine as called for by the **Combined Power** handle notch setting in the lead locomotive controller. Engine RPM is maintained under a full range of loads. The governor also monitors the engine oil and water pressures, and will take appropriate action as described in **OIL AND WATER TEMPERATURE AND PRESSURE** section of this manual, found on Page NO TAG.

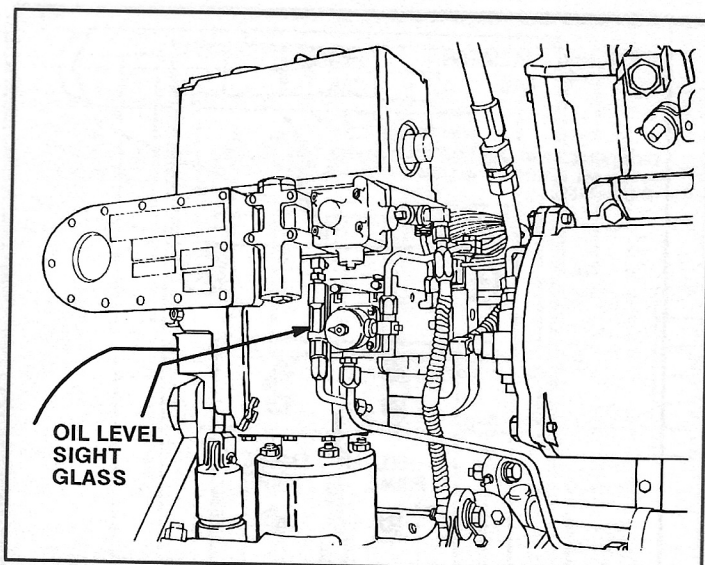


FIG. 31. ENGINE CONTROL GOVERNOR. E-32793A.

In Dynamic Braking, engine speed depends on the braking effort requested (position of **Combined Power** handle) and locomotive speed.

**NOTE 1: HIGH IDLE, REGULAR IDLE and LOW IDLE:**

HIGH IDLE	567-594
Regular IDLE	437-444
LOW IDLE	324-352

The locomotive control system will automatically reduce engine speed to **LOW IDLE** based on the following conditions:

Reverse handle centered and locomotive **NOT** in Self-Load.

OR

Reverse handle in FWD or REV for more than five minutes with Combined Power handle in IDLE.

AND

Battery charger current within certain limits based on the TIME current and voltages are within those limits.

AND

Engine cooling water and oil temperature within certain limits.

**NOTE 2:** For high altitude (above 3100 ft), engine RPM in handle Notch 1 is 704-734 and in Notch 2 is 757-787.

### Engine Speed to Combined Power Handle Position:

Combined Power Handle Position	Engine RPM	
Idle	(see Note 1)	
1	437-444	(see Note 2)
2	567-594	(see Note 2)
3	884-892	
4	884-892	
5	884-892	(see Note 3)
6	884-892	(see Note 3)
7	991-998	
8	1047-1054	(see Note 4)

**NOTE 3:** When the GE 7S1716 turbocharger is applied, engine RPM in Handle Notches 5 and 6 is 991-998.

**NOTE 4:** At certain locomotive speeds, with the **Combined Power** handle in Notch 8, engine RPM will automatically be reduced from Notch 8 speed to Notch 7 speed while maintaining Notch 8 power. This occurs only on locomotives equipped with 16 cylinder engines. This reduction occurs within a locomotive speed range which is determined by locomotive model and gearing.

## MISCELLANEOUS EQUIPMENT

### Handbrake

Located on the left side of the radiator cab.

### Engine Stop and Emergency Fuel Cut-Off System

In an emergency, any one of four electric pushbuttons may be depressed momentarily to cut off fuel delivery and shut down the engine. One of these buttons is located on each side of the locomotive platform near the fuel tank. The third and fourth buttons are located on the Engine Control (EC) panel and at the Start Station and are normally used for shutting down the engine.

**NOTE:** The Emergency Cut-Off button is used to shut down the engine on the local units only. The green/red MU SHUTDOWN pushbutton located on the overhead control console (Fig. 10, Item 10) will shut down the engines on all units of the consist simultaneously.

## PRESSURE AND TEMPERATURE GAGES

1. Control Air Gage – Located in Control Area 7 (Fig. 26). Normal control air pressure is 80 psi (551,2 kPa).

**NOTE:** The following values are nominal because of varying conditions.

2. Water Temperature Gage – Located on the right side of the water storage tank (Fig. 32). Normal operating temperature is 188–200 F (87–93 C).

## OTHER GAGES

1. Engine Lubricating–Oil Dipstick – Located on both sides of the engine near the lube–oil fill (Fig. 33). The stick is marked FULL and LOW. Proper level with the engine idling is between FULL and LOW.

**NOTE:** Overfilling will cause engine to shutdown from excessive crankcase pressure.

2. Fuel–Oil Sight Glasses – Mounted on both sides of the main fuel tank (Fig. 34) to indicate the level of fuel in the tanks.
3. Cooling Water – A water level sight glass mounted on the right side of the cooling water storage tank (Fig. 32) indicates the level of the cooling water. Markings near the sight glass indicate the proper level for various conditions of the system.

When filling the system or adding water treatment compound, proceed according to instructions mounted at the water storage tank area near the fill cap. Do not overfill.

**WARNING:** To avoid personal harm from water burns, when the water level is above FULL AT IDLE mark, NEVER remove the water fill cap. If over–full, open manual drain valve to reduce the water to a safe level.

4. Compressor Lube Oil (Fig. 35) – A dipstick, located near the fill cap, can be used to determine the oil level in the compressor crankcase.
5. Governor Oil–Level Sight Glass – Located on the left side of the engine near the traction alternator (Fig. 31). Oil level must be visible at mark on the sight glass when the engine is running at idle.

**CAUTION:** To prevent serious equipment damage, NEVER start an engine until the governor has been properly serviced with lube oil.

## DRAINING COOLING WATER SYSTEM

The cooling water system may be drained by opening the main water drain valve on the right side of the locomotive near the lube–oil pump (Fig. 36).

An Automatic Water Dump System will dump the engine cooling water when the engine is shutdown and water temperature is below 40 F (4.5 C). A thermostat actuates, tripping the solenoid in the water drain valve which opens the automatic drain valve and permits the rapid draining of the cooling water.

This system also has a Control switch located on the water tank. This switch can be used to fill the system with cold water, and to test the water dump valve.



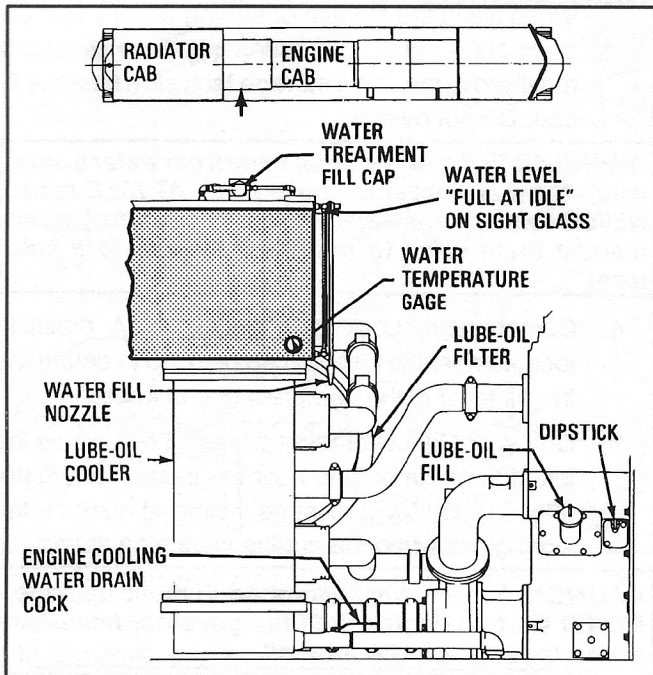


FIG. 32. ENGINE COOLING WATER SIGHT GLASS. E-34100A.

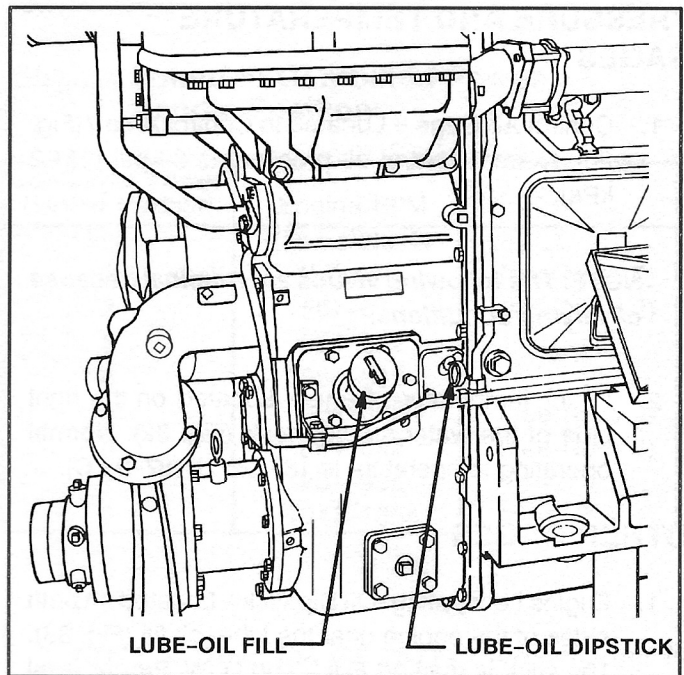


FIG. 33. DIESEL ENGINE LUBE-OIL DIPSTICK AND FILL. E-32795A.

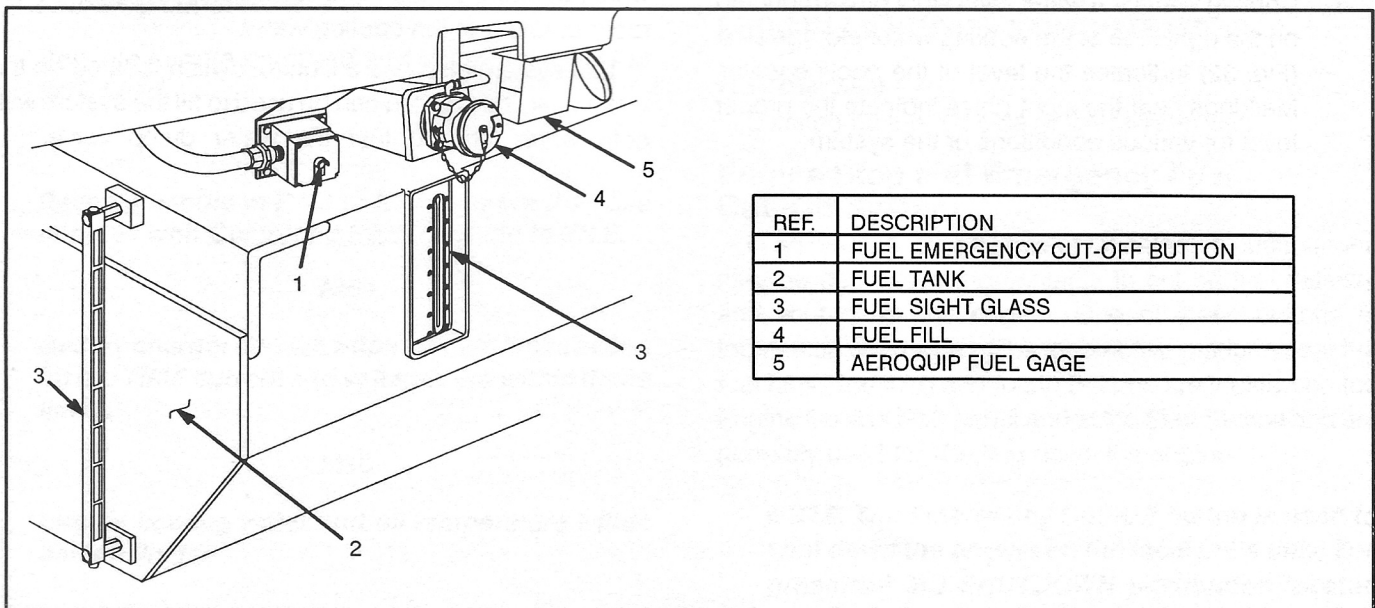


FIG. 34. "A" SIDE OF FUEL TANK (TYPICAL). E-39001.

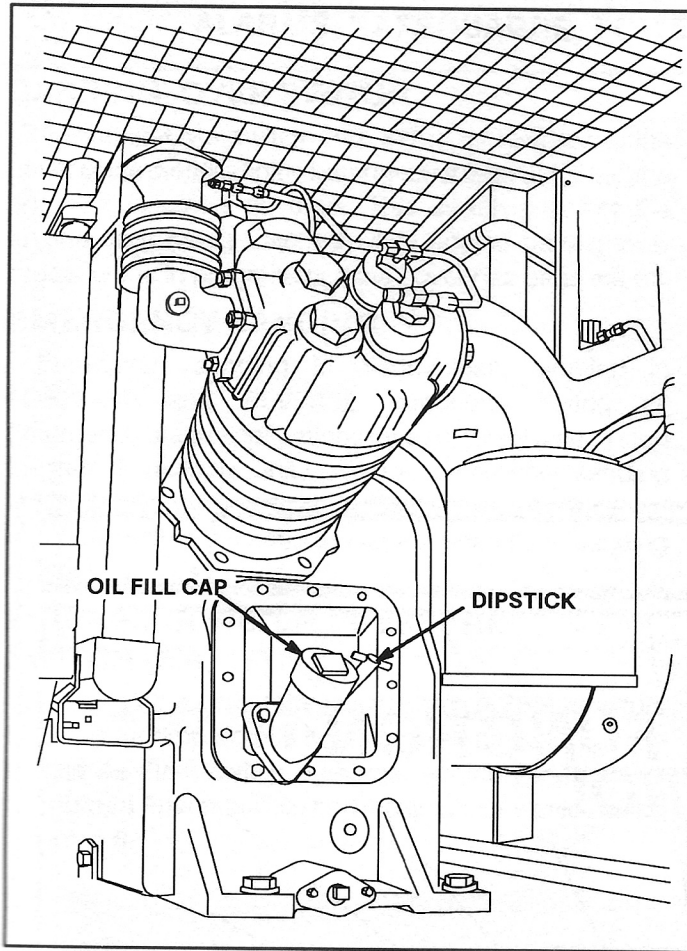


FIG. 35. AIR COMPRESSOR LUBE-OIL DIPSTICK.  
CHECK OIL LEVEL FROM RIGHT SIDE OF  
LOCOMOTIVE. E-38383A.

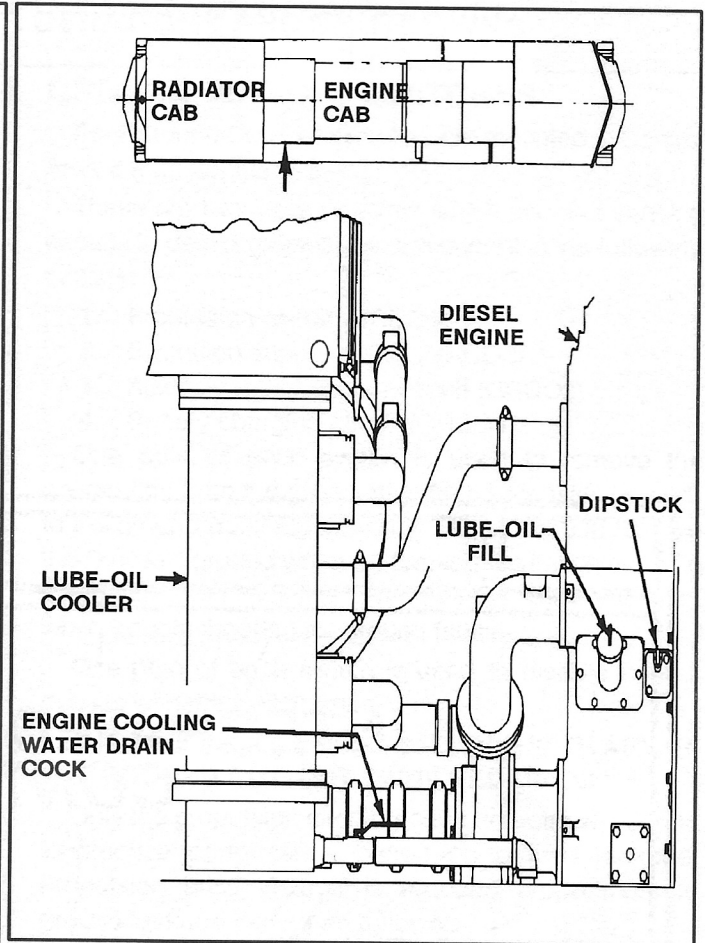
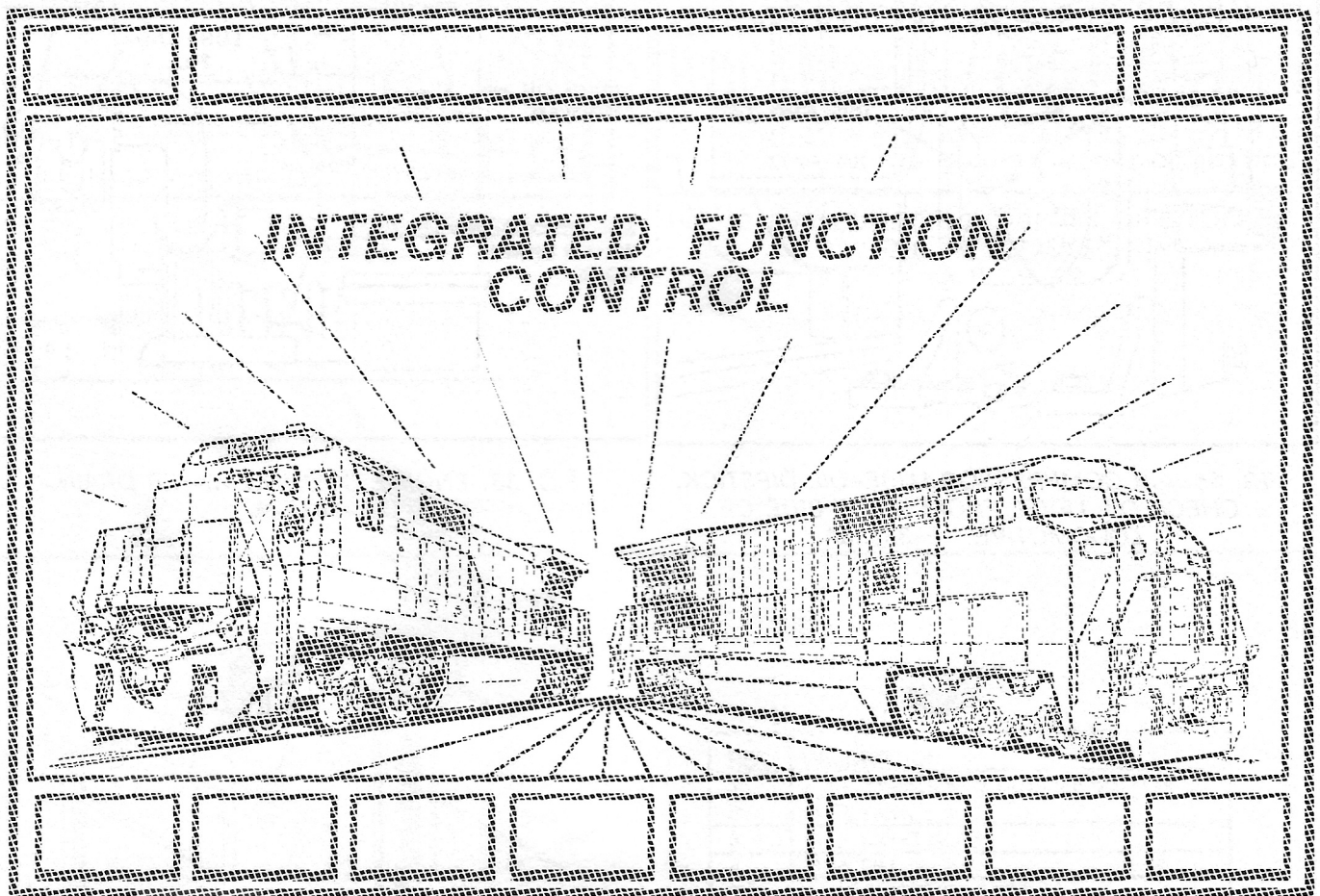


FIG. 36. ENGINE COOLING WATER DRAIN.  
E-34102A.





## ALARMS, SAFEGUARDS, POWER DERATIONS AND SHUTDOWNS

### BARRING-OVER SWITCH

A Barring-Over switch (Fig. 37) is located under the cover of the diesel engine barring-over feature behind the engine overspeed governor. This switch prevents the engine from being cranked while engine barring-over procedure is in progress or if the cover has been left off.

### EMERGENCY SANDING

Emergency sanding is automatically applied in FORWARD and REVERSE directions during all Emergency brake applications for a sufficient time to stop the train. In multiple-unit operation, emergency sanding is applied to all units, regardless of whether they are equipped with pneumatic or electro-pneumatic sanding equipment.

### ENGINE AIR FILTER PRESSURE SWITCH (Fig. 19)

The Engine Air Filter Pressure Switch (EFPS) monitors air pressure drop across the engine air filters. When the Engine Air Filter switch operates, engine RPM follows **Combined Power** handle and maximum power is limited to Notch 6.

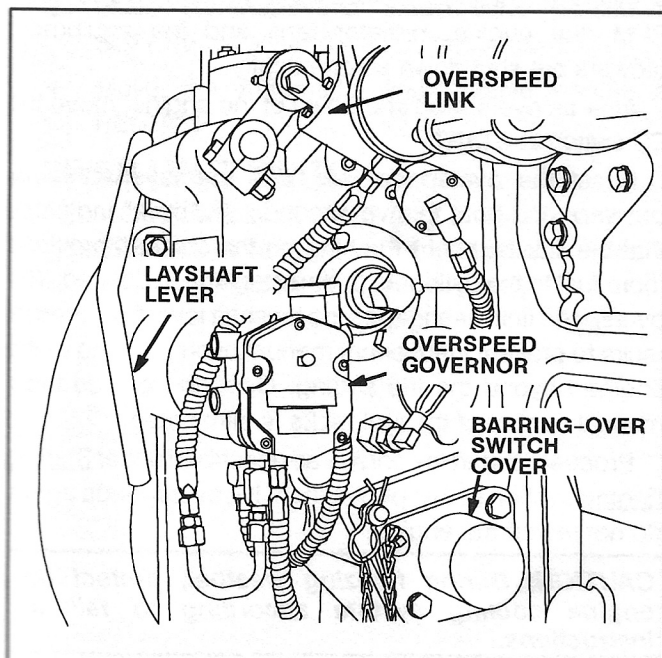


FIG. 37. ENGINE OVERSPEED SYSTEM AND BARRING-OVER SWITCH. E-31863A.

### GROUND CUT-OUT SWITCHES

Four Ground Cut-Out switches are mounted in Control Area 2 (Fig. 23, Items 9-12).

These are two-pole switches which connect sensing circuits to detect ground leakage current in the following circuits:

1. Propulsion circuit (GRCO1)
2. Excitation supply circuit (GRCO2)
3. Auxiliary motor supply circuit (GRCO3)
4. Battery charging circuit (GRCO4).

One pole of each switch is used to remove the connection from the locomotive frame (chassis ground) to the ground detection circuitry. This is used to remove the "known" ground when performing insulation tests on the locomotive circuits, or to remove the "known" ground when troubleshooting for ground faults.

One pole of each switch is used to disable control circuits with the switch open.

### THE LOCOMOTIVE WILL NOT LOAD WITH ANY OF THE GROUND CUT-OUT SWITCHES OPEN!

Only the propulsion circuit ground detector will derate locomotive performance based on ground leakage. Propulsion buss voltage is reduced proportional to ground leakage current as follows:

Ground Current Leakage (amperes)		Result
Motoring or Self-Load	Dynamic Brake	
0 to 1/2	0 to 1/4	Causes no deration.
1/2 to 1	1/4 to 1/2	Is range which will derate propulsion buss voltage from no deration at 1/4 amp to full deration at 1/2 amp.
Above 1	Above 1/2	Is considered a "solid" ground fault. Power is reduced to zero.

The other ground leakage detectors will not derate locomotive performance, but when grounds are detected, alarms will be sounded and faults will be logged on the Diagnostic Display Panel.

### MOTOR CUT-OUT SWITCHES (Fig. 9)

Traction motors can be cut out manually or automatically. Manual cut out is done with individual Motor Cut-Out switches on the EC panel. If a fault condition such as excessive current or too great a rate of

change of current (Motor Flashover) is detected, automatic cut out is done by the microcomputer control .

**CAUTION:** *It is recommended that motors only be manually cut out when the Engine Control switch is in START or ISOLATE position (unit isolated) and the Combined Power handle is in IDLE.*

**NOTE:** *Speed sensors do not need to be cut out on cut out motors. When the Motor Speed Sensor switch is in the CUT-OUT position, the speed signals from the speed sensors on motors which are cut out are ignored. For more information, see Speed Sensor Cut-Out Switch paragraph in Operating Controls.*

When a motor or motors are cut out, total power available for traction is adjusted as follows:

Motors Cut-Out	Horsepower Available for Input for Traction
All IN	Full HP
1 Out	Full HP
2 Out	Full HP
3 Out	See Note 1
4 Out	See Note 1
5 Out	See Notes 1 and 2
6 Out	None
<p><b>NOTE 1:</b> Horsepower available for input for traction is limited to 1021 horsepower per each traction motor CUT IN.</p> <p><b>NOTE 2:</b> Speed sensor inputs from at least two traction motors are required for locomotive to load.</p>	

**NOTE:** *If any motor is cut out on a locomotive, Dynamic Braking and Self-Load on that locomotive are cut out.*

## OIL AND WATER TEMPERATURE AND PRESSURE

Horsepower and/or engine speed will be altered if one of the following conditions exist:

### Cold Engine

In order to protect a cold engine from rapid warm up, restrictions are places on engine load and speed until engine temperature has reached 140 F (60 C) or higher for more than three minutes. Also, to keep engine operating temperatures within certain limits, engine speed will be altered when temperature drops below certain limits.

### Hot Engine

#### Oil or Water Temperature Between 225 and 239 F (107.5 and 115 C)

Engine RPM goes to Notch 8 and power is derated from no deration at 225 F(107.5 C) to full deration at 235 F(115 C). (Engine returns to requested Notch speed when temperature drops to 218 F – 103.5 C.)

**NOTE:** *A special combination of sensors together with a built-in program senses operation in a tunnel and permits oil or water temperature to rise to 10 F above these limits for 10 minutes before action is taken.*

#### Oil or Water Temperature Above 240 F (115.5 C)

Engine RPM Goes to Notch 1.

### Low Oil or Low Water Pressure

Low oil and water pressure are monitored by the engine control governor. If low oil pressure is detected, power is reduced by one third. If low water pressure is detected, engine speed is reduced, one notch every 20 seconds, down to Notch 2. As pressure recovers, notch is increased.

### OVERSPEED – ENGINE SHUTDOWN (Fig. 37)

In the event the diesel engine overspeeds to 1160 RPM, the engine, radiator fans and the equipment blowers are shut down automatically.

After an overspeed shutdown of the engine, move the EC switch to START.

Reset the overspeed link, **pull the layshaft lever outward** and hold for five seconds. (A “click” indicates that the link is reset.) Pushing on the layshaft provides more fuel to the cylinders during cranking, if desired. The overspeed link disengages the layshaft lever from the fuel racks to prevent inadvertent manual overspeeding of the engine beyond the trip setting. Once the device trips, manual control of the fuel racks is eliminated.

Proceed to start the engine as described under Starting Engine section of this publication. If it overspeeds again, do not restart the engine.

**CAUTION:** *During freezing weather, protect the engine cooling system according to railroad instructions.*

### OVERSPEED – LOCOMOTIVE

When a locomotive equipped with overspeed protection exceeds the maximum permissible speed, as



specified by customer, an Overspeed application is initiated.

1. The overspeed whistle blows.
2. In about five seconds, a Penalty brake application is initiated if train speed has not been reduced sufficiently. See air brake regulation for proper procedure.

## PCS SWITCH OPERATION

The Pneumatic Control Switch (PCS) is operated from the air brake system. During a safety control Penalty or Emergency brake application, this switch opens. Operation of this switch (through the PCR relay) will affect engine speed (limited to Idle or Notch 1), available locomotive power and light the "PCS OPEN" warning light on the Operator Function Display (Fig. 6).

Operating options selected by the railroad will determine how the locomotive control system will react to PCS operation. See railroad operating rules and the locomotive air piping and electrical schematic diagram for application to specific locomotives.

To reset the PCS switch:

1. Move the **Combined Power** handle to IDLE.

**NOTE: If the PCS switch has tripped while in dynamic braking, the Combined Power handle must be returned to OFF to reset the circuit.**

2. Move the Automatic Brake Valve handle to SUPPRESSION and wait 30 seconds.
4. Move the Automatic Brake Valve handle to RELEASE.

## POWER LIMIT SWITCH

When the Power Limit switch (Fig. 8, Item 7) is closed, Engine RPM is limited to Notch 7 and Maximum Power is limited to Notch 7 **on this locomotive only**.

## WHEELSLIP

The locomotive computers continuously monitor axle speed. The axle (or wheel) speed of all axles are compared. If the differential in speeds is greater than a preset limit, power will be reduced and sand applied. Once the differential in speeds falls within the preset limit, power will be returned to the motors (per engine load rate schedule).

In dynamic braking, the amount of correction is determined by the amount of slide and is accomplished in several stages:

### Stage 1 – Sand (Dynamic Braking)

Automatically apply sand to the leading axles on this locomotive if a small difference in motor speeds is detected. Sanding continues for three seconds after the slide is corrected.

### Stage 2 – Small Power Reduction (Dynamic Braking)

When the Stage 1 limit is exceeded, a small power reduction goes into effect and sanding continues.

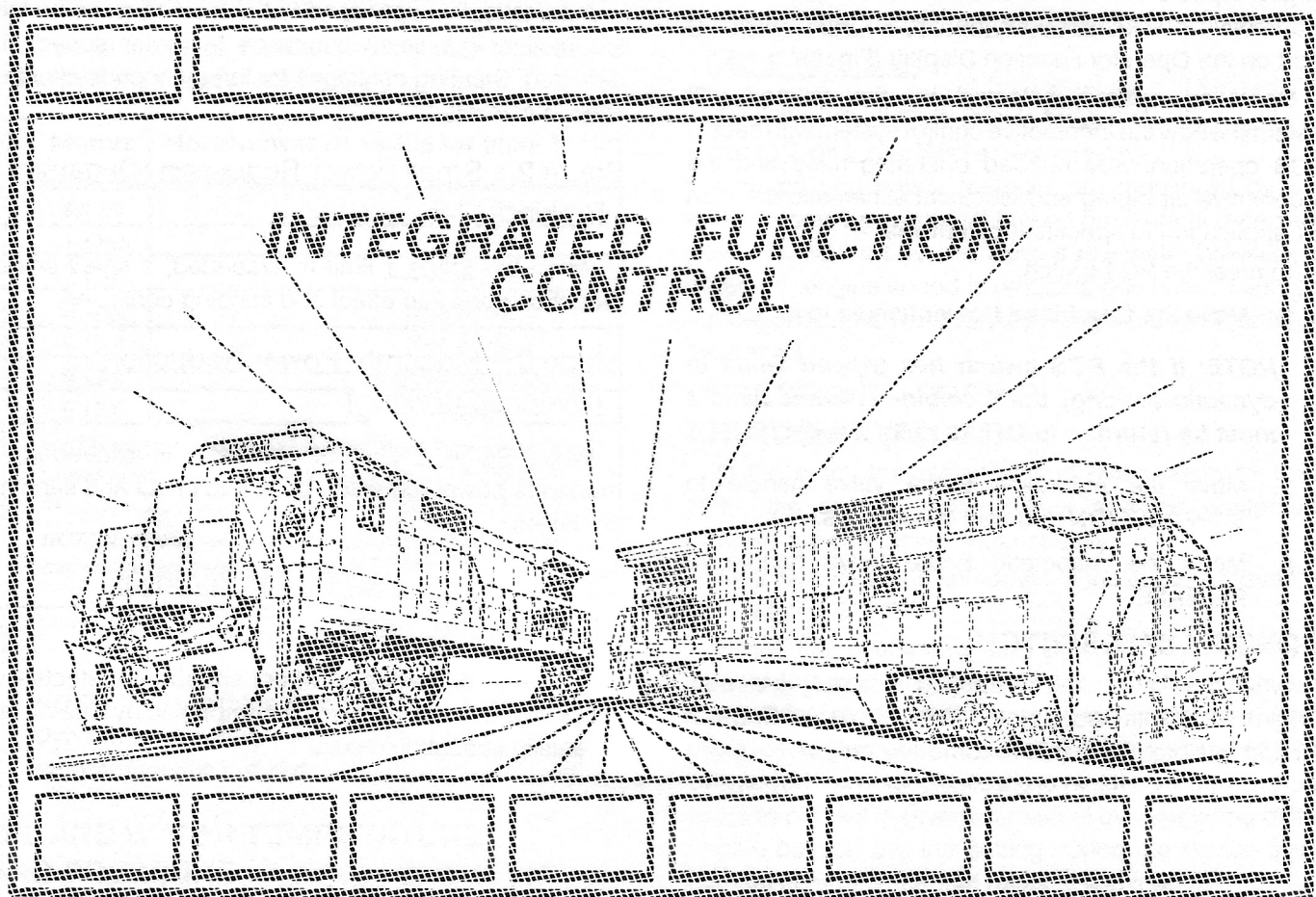
### Stage 3 – Moderate Power Reduction (Dynamic Braking)

When Stage 2 limit of wheelslip is exceeded, a moderate power reduction goes into effect and sanding continues.

### Stage 4 – Complete Power Removal (Dynamic Braking)

If a large difference in wheel speeds is detected, a quick power output removal accompanied by a trainlined wheelslip indication results.





## OPERATING PROCEDURES

### ON POWER-UP

**NOTE:** Customer equipment requirements often differ from one railroad to another. Therefore, physical locations and appearance of some devices illustrated in this manual may not agree entirely with the equipment furnished to any particular railroad. Also, see TABLES 1 and 2 (IFD Screen Flow Chart and Tree) as aids in understanding IFD operation.

On Power-up, screens will not appear for 10 to 30 seconds. If unit is set-up for "LSL", the LSL SELF TEST will be performed (see below). If not, the Gage Screen will always be on the right of the operator while the Function Screen will be on the left. Screens displayed may be interchanged at Operator discretion by pressing the **Exit** key which will display the Top Level Screen (000 000, Fig.

7). Choose which screen you want on this particular IFD, press the key and that screen will be displayed.

### LSL SELF TEST

If the "LSL" operation has been selected (switch inside locked Ultra-Cab Box), on POWER-UP all three display units will show the LSL SELF TEST screen (343 000). Per-

**TABLE 1. IFD SCREEN FLOW CHART.**

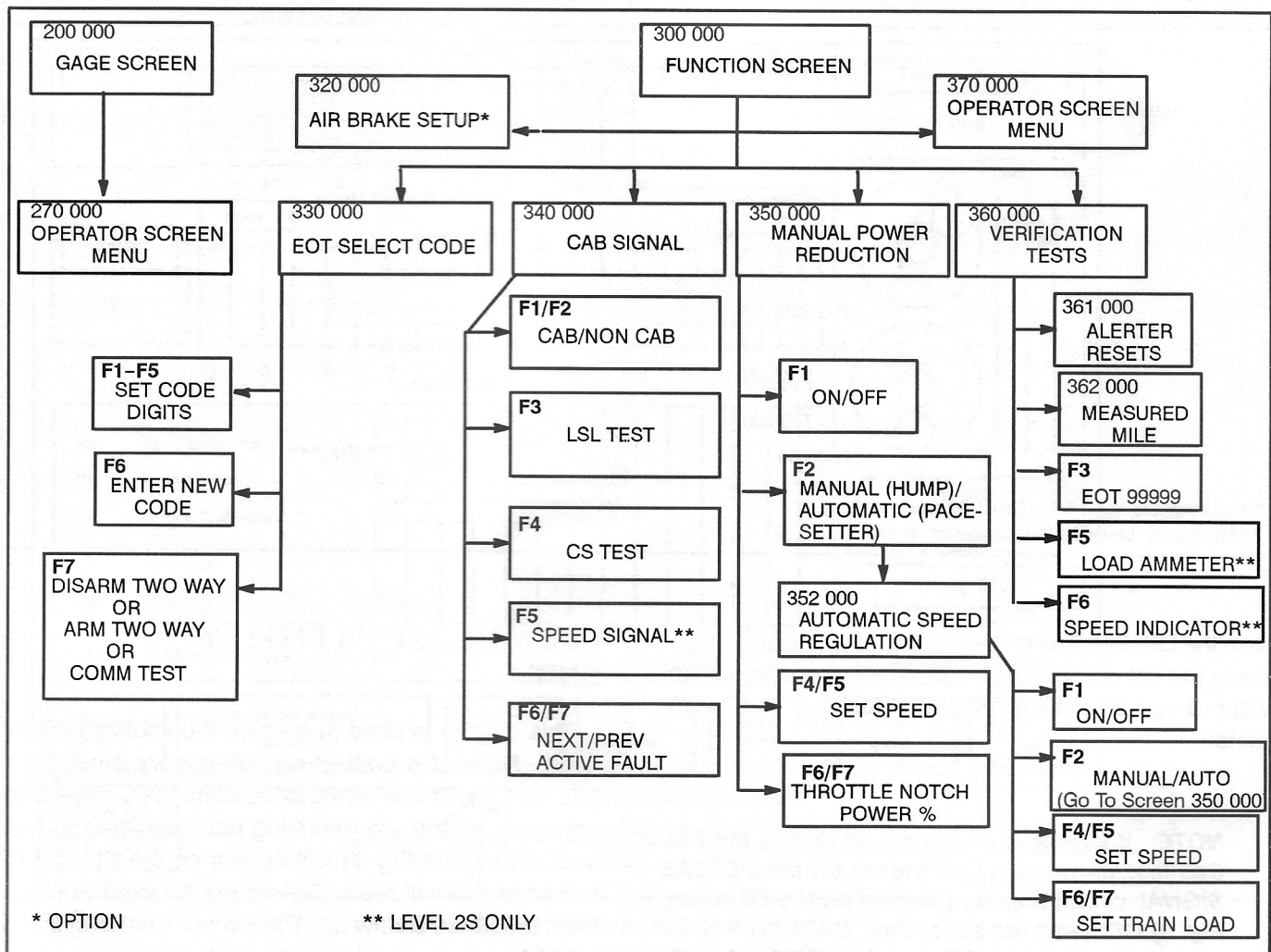


TABLE 2. IFD SCREEN TREE.

SCREEN NUMBER	SCREEN DESCRIPTION
000 000	TOP LEVEL DISPLAY
100 000	LOCOMOTIVE MONITOR**
200 000	OPERATOR GAGE DISPLAY
270 000	Operator Screen Adjust
271 000	Test Screen
277 000	Enter Password
300 000	OPERATOR FUNCTION MENU
320 000	Air Brake Setup – Current Values*
321 000	Air Brake Setup – Change Values*
330 000	End Of Train (EOT) – Select Code
340 000	Cab Signal – Menu
343 000	Cab Signal – LSL Test
344 000	Cab Signal – CS Test
350 000	Power Reduction – Manual
352 000	Automatic Speed Regulation
360 000	Function Verification Test Menu
361 000	Alerter Tests
362 000	Measured Mile Check
365 000	Load Ammeter Test**
366 000	Speed Indicator Test**
370 000	Function Screen Menu
371 000	Test Screen
377 000	Enter Password
500 000	SELECT RAILROAD***
700 000	SCREEN MENU
710 000	Test Screen
770 000	Enter Password
800 000	SYSTEM TEST MENU***

\* Not Available Yet \*\* For Level 2 Operation Only  
 \*\*\*Requires Level 2S Permission or Higher

form the LSL Self Test following Railroad Specific Procedures (do not use IFD soft keys). The locomotive control **will not** operate until a “PASSED” test has been completed.

**NOTE:** If a Fault is encountered during the LSL Self Test, correct the fault then cycle the IFC/CAB SIGNAL circuit breaker (located on the EC panel, Fig. 9) OFF (wait ten seconds– “DARK” will show on the screen – Fig. 42) and then ON to clear it.

## CREW MEMBER'S DISPLAY UNIT

This display is used to monitor locomotive performance. **Note: No control operations are available at this unit.** After the locomotive computers have been powered-up and are operating normally, the top level screen 000 000 (Fig. 7) will appear on the IFD and the message line will read: **Select the Desired Function from the Menu Below ...**. Three modes are available in Level 1:



1. Operator Functions (Key Position 2).
2. Operator Gages (Key Position 3).
3. Screen Menu (Key Position 7).

## Operator Gage Screen

Pressing this key will display screen 200 000. See appropriate paragraph of this section of this publication for operating instructions.

## Operator Function Screen

Pressing this key will display screen 300 000. See appropriate paragraph of this section of this publication for operating instructions.

## Screen Menu

Pressing this key will display screen 370 000. This screen is used to either enter the current password to change operator level so that maintenance personnel may be able to use the system for troubleshooting and other functions or to adjust screen parameters.

## OPERATOR GAGE SCREEN

**NOTE:** See TABLES 1 and 2 (IFD Screen Flow Chart and Tree) as aids in understanding IFD operation.

This screen (see Fig. 38) is used to monitor locomotive performance. After the locomotive computers have been powered-up and are operating normally, the top level screen 200 000 will appear on the IFD and the message line will read: **Select the Desired Function from the Menu Below ...**. Four functions are available in Level 1:

1. Alarm Test (Key Position F1).
2. Distance Counter (Key Positions F2 through F6).
3. Screen Menu (Key Position F7).
4. Exit (Key Position F8). **Note: Key Position F8 is always EXIT (no matter what screen is displayed).**

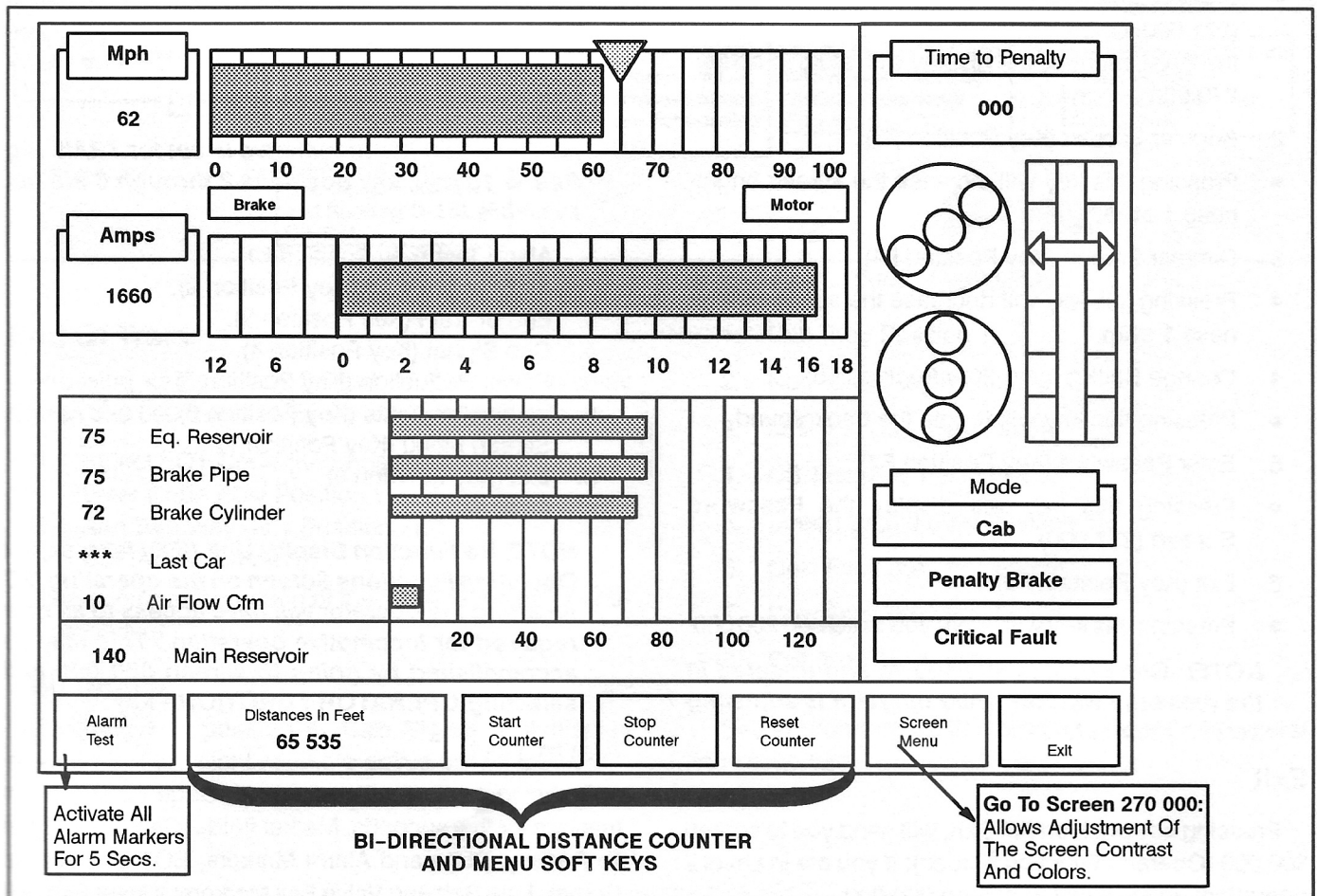


FIG. 38. OPERATOR GAGE SCREEN (200 000). E-39924A.

## Alarm Test

Pressing this key will activate all Gage Screen alarm markers for five seconds. Marker fields (Time To Penalty; State; Alarm; Decel Arrow) will go yellow.

## Distance Counter

A counter (displayed in key positions F2 and F3) is included to show distance traveled in feet. Key positions F4, F5 and F6 (**Start Counter**, **Stop Counter** and **Reset Counter**) control the counter. This counter operates independently from the counters on the other IFD. The counter counts "up" when locomotive is moving forward and "down" when locomotive is in reverse.

## Screen Menu

Pressing this key will display screen 270 000. Six keys are active on this screen:

1. Test Screen (Key Position F1).
  - Pressing this key will display the **Test Screen** (271 000; colored blocks) for three seconds. After the three seconds the display will return to screen 270 000.
2. Brighter Screen (Key Position F3).
  - Pressing this key will increase the screen brightness **1 step**.
3. Dimmer Screen (Key Position F4).
  - Pressing this key will decrease the screen brightness **1 step**.
4. Change Background (Key Position F5).
  - Pressing this key will toggle the background.
5. Enter Password (Key Position F7).
  - Pressing this key will display the **Password Screen** (277 000).
6. Exit (Key Position F8).
  - Pressing this key will return you to screen 200 000.

**NOTE:** Gage data is still shown and updated in the message window while operator is adjusting screen parameters.

## Exit

Pressing key position F8, **Exit**, will send you to screen 300 000 (Operator Function Screen); if you are in Level 2 operation, you will exit to screen 000 000.

## OPERATOR FUNCTION SCREEN

**NOTE:** See TABLES 1 and 2 (IFD Screen Flow Chart and Tree) as aids in understanding IFD operation.

This screen (see Fig. 39) is used to operate the unit and monitor locomotive performance. Both Operator Gage and Operator Functions data will be shown on one screen. **Note:** Operator Gage data is shown in a compressed form (i.e., data is shown in numerical form only – no graphical representations). The gage data will continuously update and the functional data will update automatically as the operator changes locomotive parameters; **throttle** handle position for example. Also included on this screen are warning lights: Wheel Slip, PC Open, Sand On, Brake Warn, Low Air, No Com, Low Batt, Valve Fail, EOT Emergency and Alerter. Warning lights will appear and turn yellow to indicate trouble. After the locomotive computers have been powered-up and are operating normally, the top level screen 300 000 will appear on the IFD and the message line will read: **Select the Desired Function from the Menu Below ...**. Eight functions are available in Level 1:

**NOTE:** When the locomotive is set for **TRAIL (Eq Res < 10 psi)**, key positions 2 through 5 are not available.

1. Alarm Test (Key Position F1).
2. Air Brake Setup\* (Key Position 2).
3. End of Train (Key Position 3).
4. Cab Signal (Key Position 4).
5. Power Reduction (Key Position 5).
6. Verification Tests (Key Position 6).
7. Screen Menu (Key Position 7).
8. Exit (Key Position 8).

\* Optional

**NOTE:** If a Function Display Unit (IFD) fails, select **Operating Functions Screen** on the operating IFD ensuring the operator will have access to all data required for locomotive operation. This may be accomplished by going to screen 000 000 and selecting **OPERATOR FUNCTIONS** key.

## Alarm Test

Pressing this key will activate all Gage Screen alarm markers for five seconds. Marker fields (Cab Signal Time To Penalty, State and Alarm Markers; EOT Low Air, No Comm, Low Batt and Valve Fail Markers; Wheel Slip, PC Open, Sand On and Brake Warn Markers; Alerter Block) will go yellow; otherwise, they are invisible.

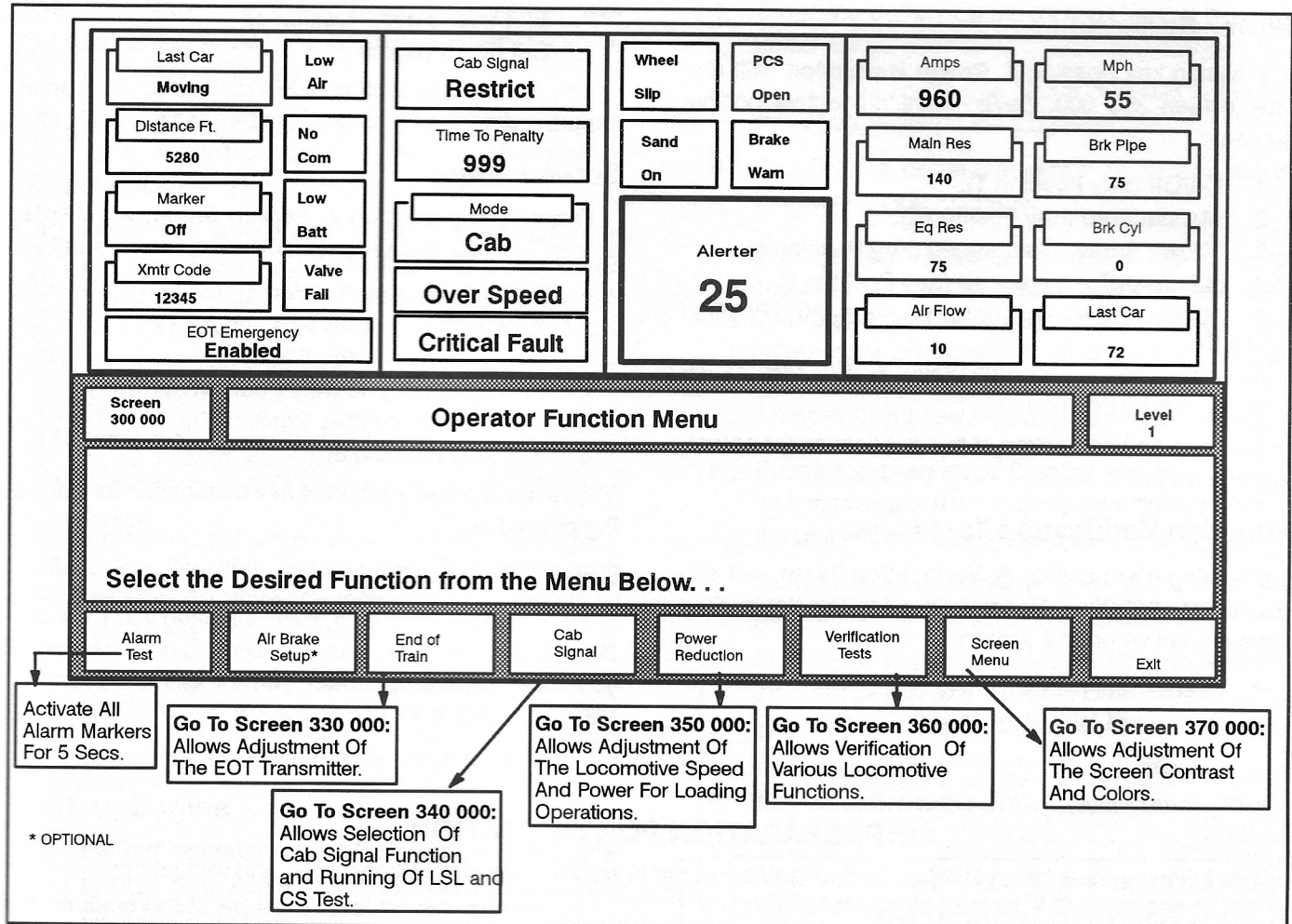


FIG. 39. OPERATOR FUNCTIONS SCREEN (300 000). E-39925A.

## End Of Train

Pressing key position 3, **End of Train**, will display screen 330 000. Eight keys are active on this screen:

1. Select EOT Code (Key Positions 1–5).
2. Enter Code (Key Position 6).
3. Arm Two Way (Key Position 7).
4. Exit (Key Position 8).

See appropriate section of this publication for operating procedure.

## Cab Signal

Pressing key position 4, **Cab Signal**, will display screen 340 000. Eight keys are active on this screen:

1. Cab (Key Position 1).
2. Non-Cab (Key Position 2).
3. LSL Test (Key Position 3).
4. CS Test (Key Position 4).
5. Speed Signal (Key Position 5).
6. Next Fault (Key Position 6).
7. Prev Fault (Key Position 7).
8. Exit (Key Position 8).

See appropriate section of this publication for operating procedure.



## Power Reduction

Pressing key position 5, **Power Reduction**, will display screen 350 000. Seven keys are active on this screen:

1. On/Off (Key Position 1).
2. Manual/Auto (Key Position 2).
3. "Down Arrow" – set speed (Key Position 4).
4. "Up Arrow" – set speed (Key Position 5).
5. "Down Arrow" – set notch power % (Key Position 6).
6. "Up Arrow" – set notch power % (Key Position 7).
7. Exit (Key Position 8).

See appropriate section of this publication for operating procedure.

## Function Verification Tests

Pressing key position 6, **Verification Tests**, will display screen 360 000 – Alerter Verification Test Setup. Four keys are active on this screen:

1. Alerter Test (Key Position 1).
2. Measured Mile (Key Position 2).

3. EOT 99999 (Key Position 3).
4. Exit (Key Position 8).

See appropriate section of this publication for operating procedure.

## Screen Menu

Pressing key position 7, **Screen Menu**, will display screen 370 000. Six keys are active on this screen:

1. Test Screen (Key Position 1).
2. Brighter Screen (Key Position 3).
3. Dimmer Screen (Key Position 4).
4. Change Backgrnd (Key Position 5).
5. Enter Password (Key Position 7).
6. Exit (Key Position 8).

See appropriate section of this publication for operating procedure.

## Exit

Pressing key position 8, **Exit**, will send you to screen 200 000 (Operator Gage screen, see previous section); if you are in Level 2 operation, you will exit to screen 000 000.

## PREPARATION FOR OPERATION

The following checks and inspections should be made in accordance with railroad rules and regulations:

### Before Boarding Locomotive

1. Inspect for broken, worn, loose or dragging parts (brake rigging, brake shoes, wheels, traction motor commutator covers, etc.).
2. Check for leaks from outside piping.
3. Properly position all drain and cut-out cocks.
4. Check the proper connections for air hoses and jumper cables (if in multiple with other units).
5. Check the fuel supply on the fuel tank sight glass.

### After Boarding Locomotive

1. WITH ENGINE SHUTDOWN, remove rags, tools, etc., from moving parts and electrical equipment.
2. Check the diesel engine lubricating-oil supply. Oil level should indicate FULL on the dipstick with the engine shut down or at IDLE. The dipstick is located on the side of the engine near the lube-oil fill and is marked LOW and FULL.
3. Check the governor oil supply. The sight glass on the governor should be full of oil. After engine is

started, the oil level must be at the mark on the sight glass.

4. Check the air compressor lubricating-oil level.

**WARNING: While servicing the air compressor, open Local Control Circuit Breaker (LCCB, Item 16, Fig. 9) to prevent air compressor motor from starting.**

5. Check the cooling water supply. Ensure the water drain valve is closed.
6. Check that the diesel-engine overspeed device is reset.
7. Check that the engine barring-over device is removed from the engine and cover is mounted in place.
8. Check that the following air cut-out cocks are open:
  - a. Air Compressor Governor.
  - b. Control Air.
  - c. Bell, Horn and Window Wiper.
9. Check that the brake-pipe angle cocks are properly positioned.

10. The brake-pipe pilot cut-out valve (double-heading cock) on the 26-L air brake system should be properly positioned.
11. The dual ported cut-out cock must be positioned according to the location of the unit in the locomotive consist.
12. Check the positions of the Automatic and Independent Brake Valve handles. The Automatic Brake Valve handle should be moved to the HANDLE OFF position on all Trail units, and the Independent handle should be in RELEASE if not removable.
13. Move the Engine Control switch to START.
14. Properly position the MU Headlight Selector switch.
15. Ensure the green/red MU SHUTDOWN pushbutton (Fig. 10, Item 10) located on the Overhead Console is not engaged (green IN, red OUT).
16. Check that the **Combined Power** handle is in IDLE and the **Reverser** handle is in OFF.
17. Check that the dead-engine cock is closed.

## Starting Engine

1. Perform operations as in **Before Boarding Locomotive and After Boarding Locomotive** sections listed previously.
2. If the engine has been stopped for a considerable period of time, or if a quantity of rain has entered the stack, before starting the engine the cylinders should be cleared of fuel or water accumulation. Proceed as follows:
  - a. Apply the engine barring-over device, and back off the compression relief plugs on the left side of each cylinder.
  - b. Rotate the engine at least two complete revolutions by use of the engine barring-over device.
  - c. Remove the barring-over device from the engine, and tighten all compression relief plugs before cranking.

**NOTE: Cover for barring-over feature must be securely mounted, otherwise engine cannot be cranked. See Barring-Over Switch paragraph in the **ALARMS AND SAFEGUARDS** section of this publication.**

3. Close the Battery switch located behind the door under the EC panel.
4. Turn ON all applicable circuit breakers in the top row of breakers on the EC panel.
5. Turn ON **ALL** circuit breakers in the second row of breakers on the EC panel.

**NOTE: When starting engines of several locomotives in a multiple-unit consist, start engines one at a time. Close the Control circuit breaker only on one unit at a time. When all engines are running, close the Control circuit breaker on the Lead unit only, open all others.**

6. Check the Diagnostic Display and IFDs for any fault messages. If the display says "Won't Crank," the unit will not attempt to crank.
7. Verify the Engine Control (EC) switch in the START position.
8. At the Start Station, located near the engine, turn the Start switch to the PRIME position. Hold until solid fuel flow with no bubbles shows in the sight glass.
9. Turn the switch to the START position and hold until the engine starts.

**CAUTION: Do not discharge the battery excessively by repeated attempts to start. If the first two or three tries are unsuccessful, recheck the starting procedure.**

**NOTE: On start-up, note the following:**

1. **There will be a two to four second delay between the time the switch is placed in the START position and the diesel engine starts to rotate.**
2. **If proper engine lube-oil pressure does not build up within approximately 40 seconds, the governor will shut off fuel and prevent the engine from running.**

## Before Moving Locomotive

1. Turn the Engine Control switch to RUN.
2. Make an air brake test and other checks in accordance with railroad rules and regulations.
3. Check the main reservoir air pressure according to railroad rules and regulations.
4. Check the control air pressure. Normal pressure is 80 psi (551 kPa).



5. Make an Independent air brake application. Release the handbrake and remove any blocking of the wheels.
6. Allow time for the engine cooling water to warm up before moving the locomotive in accordance with railroad rules and regulations. Also review **ALARMS, SAFEGUARDS, POWER DERATIONS AND SHUTDOWNS** section of this manual.
7. Check the Diagnostic Display panel and IFDs for any fault messages. It should say "Ready."
8. Perform the **Alerter Test** found on Operator Functions screen (see appropriate section of this publication for operating instructions).
9. Perform **Cab Signal** and **LSL Self Tests** in accordance with Railroad Specific Procedures.

### Faster Air Pumping

To provide faster air pumping on locomotive, when reservoirs have been drained or after the locomotive has been coupled to a train, proceed as follows:

1. Leave the Generator Field circuit breaker in the OFF position.

2. Close the Control breaker on the Engine Control panel.
3. Insert the **Reverser** handle (place in center OFF position).
4. Move the **Combined Power** handle to Notch 1. The air compressor speed is twice engine speed when the engine speed is below 525 RPM.

**NOTE: If the main reservoir air pressure is above 130 psi (896 kPa) and is not rising, increasing the engine speed will not raise the pressure.**

### Cold Weather Engine Starting/Warm-up

During cold weather conditions, when a locomotive has been shutdown for a period of time, locomotive horsepower will automatically be derated until the lubricating oil temperature reaches a predetermined level. This special warm-up period is required to avoid equipment failure from thermal or overload strain. See **ALARMS, SAFEGUARDS, POWER DERATIONS AND SHUTDOWNS** section of this manual.

## OPERATING PROCEDURES

### Moving A Train

1. Close the Generator Field circuit breaker on the control console.
2. Move the **Reverser** handle to the desired direction of movement.
3. Release the brakes completely. Several minutes may be required to release the brakes, depending on the length of the train.
4. Advance the **Combined Power** handle.
5. The **Combined Power** handle has notches (IDLE up to Notch 8), with each successive notch representing an increase in power, or locomotive tractive effort.

Starting a train depends on type, length, weight, grade, condition of rail and amount of slack in the train. This locomotive is designed to have easily controlled tractive effort build-up characteristics, with the tractive effort in each notch limited to definite values as the **Combined Power** handle is moved from the lowest to the highest notch. The engineer can easily control the

amount of tractive effort required to start and accelerate a particular train. Speed can be controlled as desired by reducing or increasing the **Combined Power** handle position.

### Stopping A Train

Move the **Combined Power** handle to IDLE, and apply the dynamic or air brakes according to railroad regulations. Also see **Applying Dynamic Brakes** found later in this section of the manual. If leaving the engineer's position after the train has stopped, move the **Reverser** handle to OFF.

**CAUTION: The control system of this locomotive will delay movement from power to dynamic braking. If however, other locomotives in the consist do not have this feature, to prevent equipment damage when changing from power to dynamic braking or from dynamic braking to power, pause 10 seconds with the Combined Power handle at IDLE.**

### Reversing Locomotive

1. Bring the locomotive to a full stop.
2. Move the **Reverser** handle to the opposite direction.



3. Release the brakes.
4. Advance the **Combined Power** handle.

### Passing Through Water

Do not exceed two or three MPH if there is water over the rails. Do not pass through water that is over 2.5 in. (63,5 mm) above the top of the rail.

### Passing Over Railroad Crossings

Do not pass over railroad crossings at full power – traction motor flashover may result. While all units are passing over the crossing, reduce power by moving the **Combined Power** handle to Notch 5, or below.

### Stopping Engine

1. Move the **Combined Power** handle to IDLE.

**CAUTION:** After a locomotive has operated under full load for a considerable period of time, allow the engine(s) to run at IDLE for at least five minutes before shutting down. Otherwise, immediate shutdown after such operation could be harmful to some engine components requiring brief idling time to allow for cool-down.

2. Open the Generator Field circuit breaker on the control stand.
3. Move the Engine Control switch to START.
4. Press the Engine Stop button on the Engine Control panel or at the Engine Start Station.
5. To shut down all engines when in multiple-unit operation, depress the green/red MU SHUTDOWN pushbutton (red IN, green OUT) located on the Overhead Console (Fig. 10, Item 10).

**NOTE:** On some older units this will not turn off the fuel pumps. Pushing the STOP button on each unit will turn them off.

6. Secure the locomotive in accordance with railroad rules and procedures.

### Before Leaving Locomotive

1. Apply the handbrake and release the air brakes after uncoupling from the train.
2. Leave the **Combined Power** handle in IDLE.
3. Close the windows and doors.
4. Open all switches and circuit breakers as described in **Control Console Equipment** and **Engine Control Panel** paragraphs located in the OPERATING CONTROLS section of this manual.
5. Open the Battery switch.

6. In freezing weather, precautions must be taken to see that the cooling water does not freeze. See **Draining Cooling Water System** paragraph found in the **OTHER EQUIPMENT** section of this manual, and follow railroad rules for this situation.

### Safety Controls

After a Penalty brake application has occurred, normal locomotive operation is restored in the following manner:

1. Move the **Combined Power** handle to IDLE.
2. Move the Automatic Brake Valve handle to SUPPRESSION.
3. Wait 30 seconds, then move the Automatic Brake Valve handle to RELEASE.

### DYNAMIC BRAKE OPERATION

Dynamic braking is applied to the locomotive only, not to the train.

#### Applying Dynamic Brakes

Applying dynamic braking is done in the following manner:

**NOTE:** Dynamic brake cannot be applied on a locomotive which has any traction motor manually or automatically cut out.

1. Move **Combined Power** handle to IDLE.
2. Move the **Combined Power** handle to SET-UP position; pause, then advance the handle into the BRAKING sector as desired.
3. After the slack is bunched, manipulate the **Combined Power** handle until the desired braking effort is obtained. Observe and correct braking effort during the initial period of Dynamic Brake application.

The amount of braking effort obtainable varies with the position of the **Combined Power** handle for various speeds. Maximum braking effort is obtained in the FULL BRAKING position at 25 MPH.

In extended range dynamic braking a series of additional peak braking efforts will occur at 17 and 13 MPH.

**NOTE:** Wheel slip warning may occur while in dynamic braking. This indicates wheels are sliding. Sand is applied automatically to the wheels of the sliding unit. Until the warning stops, reduce the **Combined Power** handle position.

## Use Of Air Brakes During Dynamic Braking

**NOTE: When independent brake is applied, dynamic braking effort is decreased. The amount of reduction depends on locomotive speed. At 25 MPH (approximately) or above there is no decrease in braking effort. Below 25 MPH dynamic braking effort is reduced as locomotive speed is reduced to a minimum dynamic braking effort at 0 MPH.**

When necessary, the automatic air brake may be used in conjunction with the dynamic brake. Automatic air brakes will apply on the train but not on the locomotive. If the Automatic Air Brake handle is moved to the EMERGENCY position, the dynamic brake is removed and brakes on the locomotive, as well as those on the train, go into Emergency application.

When dynamic braking is being used, the Dynamic Brake Magnet Valve (DBM) nullifies an Automatic air brake application on the locomotives. This same interlock will release an Automatic application on the locomotives when dynamic brakes are set-up, and prevents reapplication of the automatic brake on the locomotive after release of the dynamic brake.

## Release Of Dynamic Braking

Release dynamic braking by moving the **Combined Power** handle to the OFF position.

## Operating As A Leading Unit

To operate the locomotive as a Lead unit of a consist, first make the necessary preliminary preparations for operation then proceed as follows:

### Air Equipment Set-Up

1. Insert the Automatic Brake Valve handle in the HANDLE OFF position.
2. Depress the handle of the brake-pipe pilot cut-out valve and move it to the IN position.
3. Move the handle of the dual ported cut-out cock to the IN/OPEN position.
4. Move the Independent Brake Valve handle to the FULL APPLICATION position.
5. Test the air brake in accordance with railroad rules.

### Electrical Set-Up

1. Close the Generator Field and Control circuit breakers on the control stand. (The Control circuit breaker must be closed on the Lead unit only.)
2. Close the Dynamic Brake circuit breaker.
3. Close the Trainline Fuel Pump (or Engine Run) circuit breaker. (This circuit breaker must be closed on the Lead unit only.)
4. Close all circuit breakers on the Engine Control (EC) panel.
5. Move the MU Headlight Set-Up switch to the required position.
6. Insert the **Reverser** handle into the Controller and move to the desired direction.
7. Operate the locomotive in accordance with operating procedure.

## Operating As A Trailing Unit

### Air Equipment Set-up

1. Make a Full Service application with the Automatic Brake Valve handle.
2. Move the brake-pipe pilot cut-out (double heading) valve to the OUT position.
3. Move the Automatic Brake Valve handle to the HANDLE OFF position.
4. Place the Independent Brake valve handle in the RELEASE position.
5. Move the handle of the dual ported cut-out cock to the OUT/CLOSED position.

### Electrical Set-Up

1. Move the **Reverser** Handle to OFF and remove the handle.
2. Open the Generator Field, Control, Engine Run (or Trainline Fuel Pump on EC panel) and Dynamic Brake circuit breakers on the control stand.
3. The top row of circuit breakers on the Engine Control (EC) panel can be turned OFF for Trail operation. The second row of breakers **MUST BE ON** for Trail operation. The Running Lights circuit breaker may be positioned as desired.
4. Place the MU Headlight Set-Up switch in the proper position.



## Changing Operating Ends

To change operating control from the cab of one locomotive unit to the cab of another, proceed as follows:

### Vacating Unit – Air Equipment Set-Up

1. Make a Full Service brake pipe reduction.
2. Allow time for all air blowing sounds to stop; then depress the handle of the brake-pipe pilot cut-out valve and move it to the OUT position.
3. Place the Automatic Brake Valve handle in the HANDLE OFF position and remove it; place the Independent Brake Valve handle in the RELEASE position.
4. Move the handle of the dual ported cut-out cock to the OUT/CLOSED position.

### Vacating Unit – Electrical Set-Up

1. Move the **Reverser** Handle to OFF and remove the handle.
2. Open the Generator Field, Control, Engine Run (or Trainline Fuel Pump on EC panel) and Dynamic Brake circuit breakers on the control stand.
3. The top row of circuit breakers on the Engine Control (EC) panel can be turned OFF for Trail operation. The second row of breakers **MUST BE ON** for operation. The Running Lights circuit breaker may be positioned as desired.
4. Place the MU Headlight Set-Up switch in the proper position.

### Operating Unit – Air and Electrical Equipment Set-Up

Set-Up the air brakes and electrical equipment on the operating unit as described in **Operating As a Leading Unit** “Air Equipment Set-Up” and “Electrical Equipment Set-Up” paragraphs found in this section of the manual.

## To Operate With Other Types Of Units

This locomotive is equipped with a traction motor thermal simulator which computes traction motor temperatures, this simulator will reduce locomotive output as required to protect the traction motors.

If the units in the locomotive consist are geared for differing maximum speeds, do not run at speeds in excess of that recommended for the unit having the lowest maximum permissible speed.

Similarly, do not operate at low speeds long enough to exceed the specified traction motor ratings on any of the units in the locomotive consist. A locomotive with high

horsepower per axle will develop more tractive effort at any given speed than will units of lower horsepower per axle and will, therefore, tend to overload sooner at lower speed.

When the leading unit is slipping excessively, the Power-Limit switch (Fig. 8, Item 7) can be moved to NOTCH 7 to reduce the power on this unit while the trailing units are operating at full power. This will reduce the tractive effort on the Leading unit and will usually improve the ability of the locomotive to hold the rail under bad rail conditions.

## Brake Pipe Leakage Test

A brake-pipe leakage test can be performed in the following manner:

1. With the brake system fully charged and with the brake-valve pilot cut-out cock in the IN position, move the Automatic Brake Valve handle promptly toward the SERVICE position until the equalizing reservoir pressure has been reduced to 15 psi (103 kPa); then stop and leave handle in this position.
2. As soon as the brake-pipe pressure has reduced to the level of the equalizing reservoir pressure (continuous blow from brake-valve exhaust), depress the Brake-Valve Pilot Cut-Out Cock handle and move it to the OUT position. Immediately observe the Brake-pipe gage, and time the pressure drop in accordance with railroad rules and regulations.
3. At the completion of the brake-pipe leakage test, move the Brake Valve handle further toward the SERVICE position, and reduce the equalizing reservoir pressure slightly below the brake-pipe pressure. The brake may later be released by returning the Brake Valve handle to RELEASE.

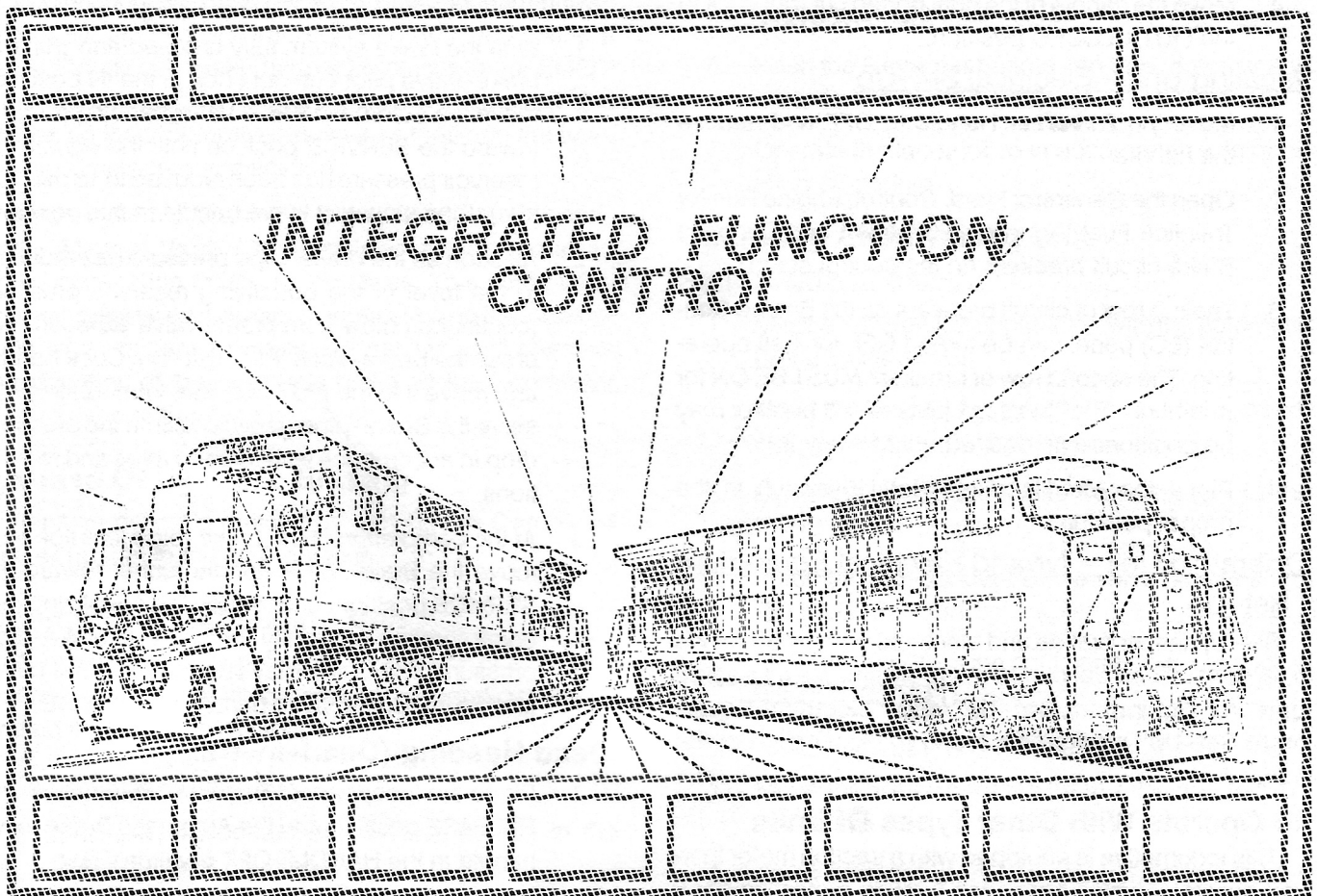
## Dead Heading (Dead-in-train)

1. Place the Independent Brake Valve handle in the RELEASE position and the Automatic Brake Valve handle in the HANDLE OFF position.
2. Depress the Brake-pipe Pilot Cut-Out valve handle and move to the OUT position.
3. Move the handle of the dual-port cut-out cock to the IN/OPEN position.

**CAUTION: To avoid wheel flats, drain main reservoir of unit 40 psi (276 kPa) below the brake pressure used on the train to which the locomotive will be coupled.**

4. Open the dead-engine cock.





## END OF TRAIN

**NOTE:** IFD screen layout is customer specific. Customer equipment requirements often differ from one railroad to another; therefore, screen illustrations and documentation may not entirely agree with the equipment furnished to any particular railroad.

### INTRODUCTION

The End Of Train (Fig. 40) function receives data from the rear-of-train-mounted transmitter. This function allows the Railroad to gather pertinent system data and ensure adequate notification on trainline breaks.

**NOTE:** Upon first applying power to the locomotive, EOT will default to One Way operation. It will take approximately 30 seconds for the front and rear units to "recognize" each other. Doing a COMM TEST (see below) after entering the Transmitter Code will lessen this required time.

### OPERATION

Pressing key position F3, **End of Train**, on the Operator Function Screen (screen 300 000, see Fig. 39) will display screen 330 000. Follow Railroad procedures for this operation. The active keys and a brief description of operation are as follows:

1. Pressing key positions F1 through F5 ("**UP**" **Arrows**) will enable change of the Transmitter Code (**Xmtr Code**) by digit.
2. Pressing key position F6 (**Enter Code**) will send the new code to the LCU (Locomotive Cab Unit).
3. Arm the Two-Way EOT (if equipped) as follows:
  - a. Press the **TEST** key on the Last Car Sense and Brake Unit (SBU) supplied by the Railroad.

The screenshot displays the 'End Of Train' screen (330 000) with the following layout:

- Top Section:**
  - Left Column:** Last Car Moving, Distance Ft. 5280, Marker Off, Xmtr Code 12345, EOT Emergency Disabled.
  - Second Column:** Low Air, No Com, Low Batt, Valve Fail.
  - Third Column:** Cab Signal Restrict, Time To Penalty 999, Mode Cab, Over Speed, Critical Fault.
  - Fourth Column:** Wheel Slip, Sand On, PCS Open, Brake Warn, Alerter 25.
  - Right Column:** Amps 960, Mph 55, Main Res 140, Brk Pipe 75, Eq Res 75, Brk Cyl 0, Air Flow 10, Last Car 72.
- Bottom Section:**
  - Header:** Screen 330 000, End Of Train, Level 1.
  - Instruction:** Use Scroll Keys to Select EOT Code.
  - Buttons:** 1, 2, 3, 4, 5 (each with an upward arrow), Enter Code, Arm Two Way, Exit.
  - Status:** EOT Status, Arm Now.

FIG. 40. SETTING END OF TRAIN TRANSMITTER CODE SCREEN (330 000). E-40980.

- b. The operator should receive a prompt from IFC that reads, ARM. The EOT STATUS block will read **Arm Now** and the surrounding block will be yellow.
- c. Press key position F7 (**Arm Two Way**). Once armed, the EOT EMERGENCY block should read: **Enabled**.

**NOTE: When the EOT Two-Way System is armed, toggling the EOT Emergency Brake Switch informs the EOT System to vent the brake pipe.**

4. Disarm the Two-Way EOT as follows:

- a. Set the EOT Code to "00000". Enter Code (F6) does not need to be pressed (key disappears) when setting code to 00000.
- b. The operator should receive a prompt from IFC that reads, DISARM. The EOT STATUS block will read **Disarm Now** and the surrounding block will be yellow.
- c. Press key position F7 (**Disarm Two Way**). Once disarmed, the EOT EMERGENCY block should read: **Disabled**.

**NOTE: If the IFC System is armed to a particular EOT System and is not properly disarmed before attempting to arm to another EOT System, the EOT STATUS block will read Armed Other and the surrounding block will be yellow. Operator must repeat Step 3 and arm the new system (automatically disarming the first system).**

5. In review, as shown in the preceding steps, pressing key position F7 will arm, disarm or test the communication with the Two Way EOT function (if equipped). The F7 key will read Comm Test, Arm Two Way or Disarm Two Way depending upon the status of the SBU as follows:

- If EOT Status Block reads SYSTEM ARMED, SYSTEM NOT ARMED or SYSTEM DISARMED – the F7 key will read Comm Test and the surrounding block will be white.
- If EOT Status Block reads ARM NOW – the F7 key will read Arm Two Way and the surrounding block will be yellow.
- If EOT Status Block reads DISARM NOW – the F7 key will read Disarm Two Way and the surrounding block will be yellow.
- If EOT Status Block reads ONE WAY, COMM TEST RUN, COMM TEST PASS, COMM TEST FAIL or ARMED OTHER – the F7 key will **NOT** appear on the screen.

6. Pressing **Exit** will return you to screen 300 000.

**NOTE: Only key position F8 (Exit) is available to the Crew Display.**



## CAB SIGNAL

**NOTE:** IFD screen layout is customer specific. Customer equipment requirements often differ from one railroad to another; therefore, screen illustrations and documentation may not entirely agree with the equipment furnished to any particular railroad.

### INTRODUCTION

Cab Signal (Fig. 41) is an optional program which enables the Railroad to keep track of unit location and to ensure high-speed rail positioning automatically.

**NOTE:** Only key position F8 (Exit) is available to the Crew Display.

Last Car Moving		Low Alr		Cab Signal Restrict		Wheel Slip		PCS Open		Amps 960		Mph 55	
Distance Ft. 5280		No Com		Time To Penalty 999		Sand On		Brake Warn		Main Res 140		Brk Pipe 75	
Marker Off		Low Batt		Mode Cab		Alerter 25				Eq Res 75		Brk Cyl 0	
Xmtr Code 12345		Valve Fall		Over Speed				Air Flow 10		Last Car 72			
EOT Emergency Enabled				Critical Fault									
340 000		Cab Signal										L1	
Active Operating Faults													
999: CS Test Fault Text													
Mode Select Cab										Test		MPH 51.7	
Cab		Non-Cab		LSL Test		CS Test		Speed Signal		Next Fault		Prev Fault	
												Exit	

FIG. 41. CAB SIGNAL SCREEN (340 000). E-40223.

## OPERATION

Pressing key position 4, **Cab Signal**, on the Operator Functional Display Unit (screen 300 000, see Fig. 39) will display screen 340 000. Follow Railroad procedures for this operation. The active keys and a brief description of operation are as follows:

**NOTE: If IFC loses communication with Cab Signal, Mode will show \*\*\* and keys F1, F2, F3 and F4 will NOT appear on the screen.**

1. Press key position F1 (**Cab**) will activate the cab signal system.
2. Press key position F2 (**Non-Cab**) will deactivate the cab signal system if the unit is operating in a non-cab zone and the speed is less than or equal to 20 mph.

**NOTE: The current status of the Cab Signal system (Cab Signal, Cab Signal Not Operative, Trail) is noted in the "Mode Select" window located above the selector keys.**

3. Pressing key positions F3 and F4 (**LSL Test** and **CS Test**) activates the computers to test the Cab Signal System (Figs. 42 and 43). **Reverser** must be out of OFF to perform test. If any faults are detected, they will appear in the window "Operating Faults" or "Test Status".

**NOTE: The locomotive will not operate once a failure is indicated on either LSL or CAB SIGNAL Test until a test passed message is received or the IFC/CAB SIGNAL circuit breaker (located on the EC panel) is cycled OFF (wait 30 seconds) then ON to clear it.**

4. Key Position F5 (**Speed Signal**) is only available in Level 2S.
5. Use key positions F6 and F7 (**Next Fault** and **Prev Fault**) to scroll through any faults indicated from LSL or CS Tests.
6. Pressing **Exit** will return you to screen 300 000.

Last Car <b>Moving</b>	Low Air	Cab Signal <b>Restrict</b>	Wheel Slip	PCS Open	Amps <b>960</b>	Mph <b>55</b>	
Distance Ft. <b>5280</b>	No Com	Time To Penalty <b>999</b>	Sand On	Brake Warn	Main Res <b>140</b>	Brk Pipe <b>75</b>	
Marker <b>Off</b>	Low Batt	Mode <b>Cab</b>	Alerter <b>25</b>		Eq Res <b>75</b>	Brk Cyl <b>0</b>	
Xmtr Code <b>12345</b>	Valve Fall	<b>Over Speed</b>			Air Flow <b>10</b>	Last Car <b>72</b>	
EOT Emergency <b>Enabled</b>		<b>Critical Fault</b>					
344 000	<b>Cab Signal Self Test</b>					L1	
Test Status							
105: Cab Signal Test Failed							
Continue Test   Repeat Test   Next Message   Prev Message							

FIG. 42. CAB SIGNAL TEST SCREEN (344 000). E-40251.



<div>Last Car Moving</div>		<div>Low Air</div>	<div>Cab Signal Restrict</div>		<div>Wheel Slip</div>	<div>PCS Open</div>	<div>Amps 960</div>	<div>Mph 55</div>
<div>Distance Ft. 5280</div>		<div>No Com</div>	<div>Time To Penalty 999</div>		<div>Sand On</div>	<div>Brake Warn</div>	<div>Main Res 140</div>	<div>Brk Pipe 75</div>
<div>Marker Off</div>		<div>Low Batt</div>	<div>Mode Cab</div>		<div>Alerter 25</div>		<div>Eq Res 75</div>	<div>Brk Cyl 0</div>
<div>Xmtr Code 12345</div>		<div>Valve Fail</div>	<div>Over Speed</div>				<div>Alr Flow 10</div>	<div>Last Car 72</div>
<div>EOT Emergency Enabled</div>		<div>Critical Fault</div>						

343 000

LSL Self Test

L1

Test Status

102: Self Test Failed

Repeat Test

Next Message

Prev Message

FIG. 43. LSL SELF TEST SCREEN (343 000). E-40252.

## POWER REDUCTION

**NOTE:** IFD screen layout is customer specific. Customer equipment requirements often differ from one railroad to another; therefore, screen illustrations and documentation may not entirely agree with the equipment furnished to any particular railroad. Also, only key position F8 (Exit) is available to Crew Display.

### INTRODUCTION

Power reduction (Fig. 44) is an optional program which gives the operator computer controlled speed for slow moving operations like loop filling (pacesetter) and hump control.

### OPERATION

Pressing key position F5, **Power Reduction**, on the Operator Function Screen (screen 300 000, see Fig. 39) will display screen 350 000. Follow Railroad procedures for this operation. The Speed Reference Gage tracks the actual locomotive mph against the set mph when this function is ON (bar disappears when function is OFF). The active keys and a brief description of operation are as follows:

1. Pressing key position F1 (**On/Off**) toggles the function ON/OFF. Function status is indicated above the key position.

**NOTE:** When the screen is displayed from the Operator Function screen, the defaults are:

1. Function - OFF; Mode - MANUAL.

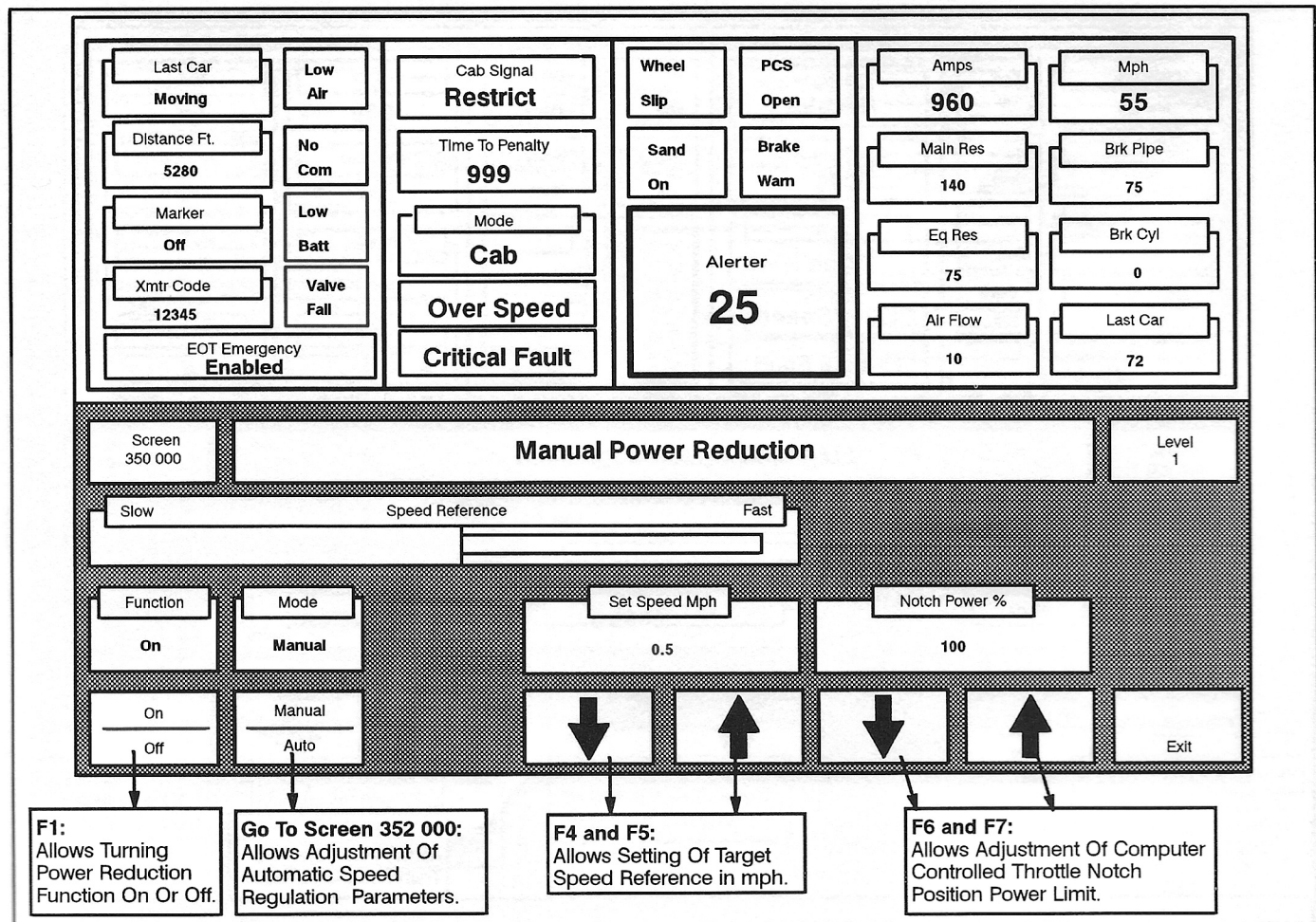


FIG. 44. POWER REDUCTION SCREEN (350 000). E-40981.



2. **Mode key is active.**
  3. **Notch Power % – 100 %.**
  4. **Set Speed – Last set value (0 mph on initial power-up).**
  5. **Set Train Load (Automatic Mode) is Medium.**
2. Pressing key position F2 (**Manual/Auto**) brings-up screen 352 000 (Automatic Speed Regulation – see Fig. 45). The only difference between Automatic and Manual screens are key positions F6 and F7 (**Set Train Load** in Automatic, screen 352 000, mode). Mode status is indicated above the key position.

**NOTE: Using “Set Train Load” adjusts the computers sensitivity or speed that the system reacts to a change.**

3. Use key positions F4 and F5 to decrease or increase the Set Speed (Mph) and display from 0.3 to 10 mph.

**NOTE: While unit is in manual mode, the computer will NOT regulate the speed.**

4. Use key positions F6 and F7 to decrease or increase the Notch Power (%) limit (in Manual Mode) and display. For example: Setting this at 50% and placing **Combined Power** handle in Notch 1 will give you approximately 150 Amps instead of the normal 300 Amps.

**NOTE: Operator can change Set Speed and Notch Power % with this function ON or OFF.**

5. Pressing **Exit** will return you to screen 300 000.

**NOTE: Centering the Reverser Handle or applying dynamic brakes has the same affect on this function as pressing the OFF key.**

6. Returning **Throttle** handle to IDLE at any time will restore normal locomotive operation.

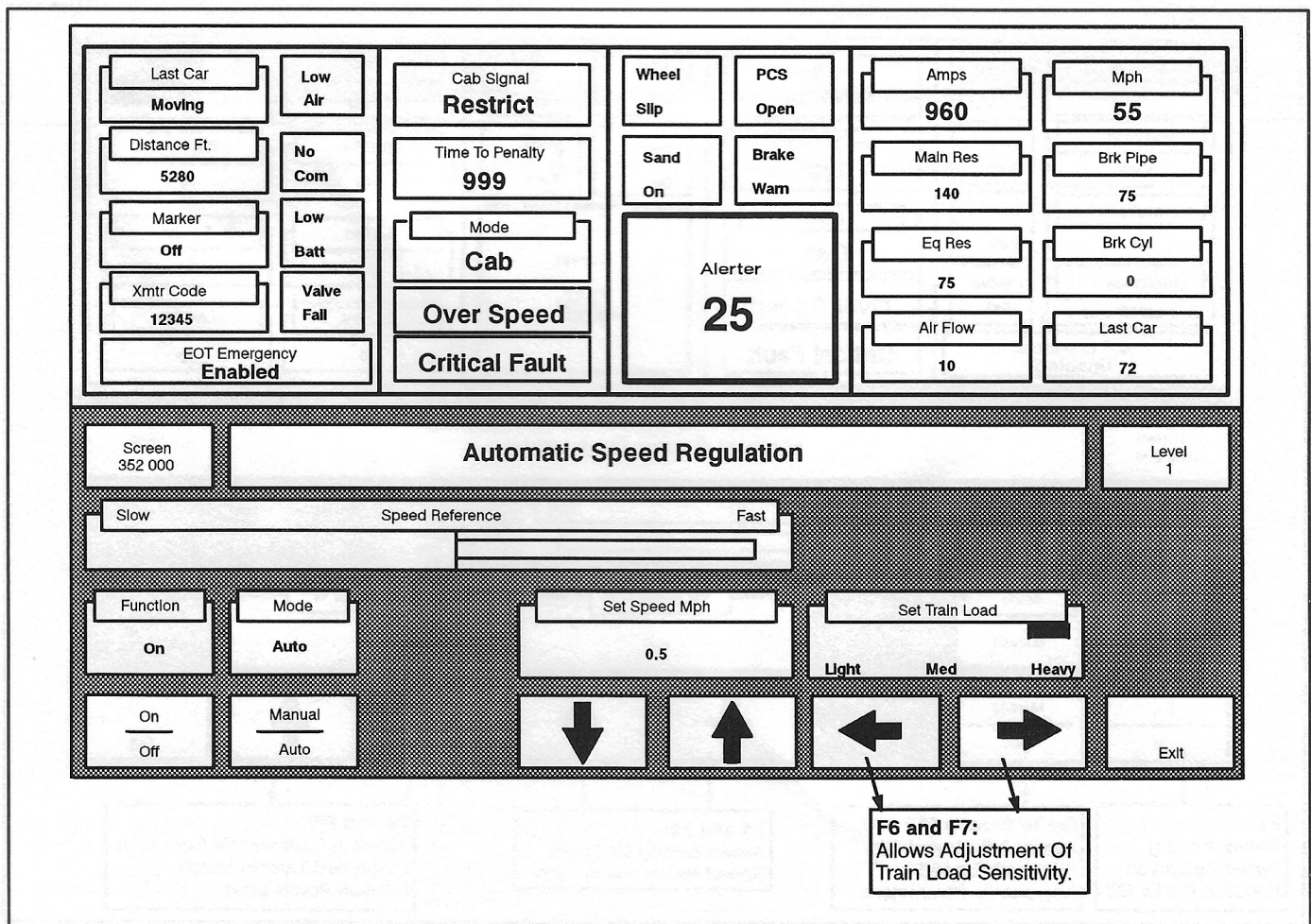


FIG. 45. POWER REDUCTION, AUTOMATIC MODE, SCREEN (352 000). E-40982.



## FUNCTION VERIFICATION TESTS

**NOTE:** IFD screen layout is customer specific. Customer equipment requirements often differ from one railroad to another; therefore, screen illustrations and documentation may not entirely agree with the equipment furnished to any particular railroad.

### INTRODUCTION

The Function Verification Tests (Fig. 46) is a series of optional programs giving the operator a means to test various locomotive operating systems (perform a Measured Mile Test) and also to ensure that the alerter system is operating properly.

### OPERATION

Pressing key position F6, **Verification Tests**, on the Operator Function Screen (screen 300 000, see Fig. 39) will display screen 360 000. Follow Railroad procedures for this operation. The active keys and a brief description of operation are as follows:

1. Pressing key position F1 (**Alerter Tests**) will display screen 361 000 (Fig. 47). This key is only active if the EC Switch is in RUN position and unit speed is below three mph (not available on the Crew Display). The active keys and a brief description are as follows:

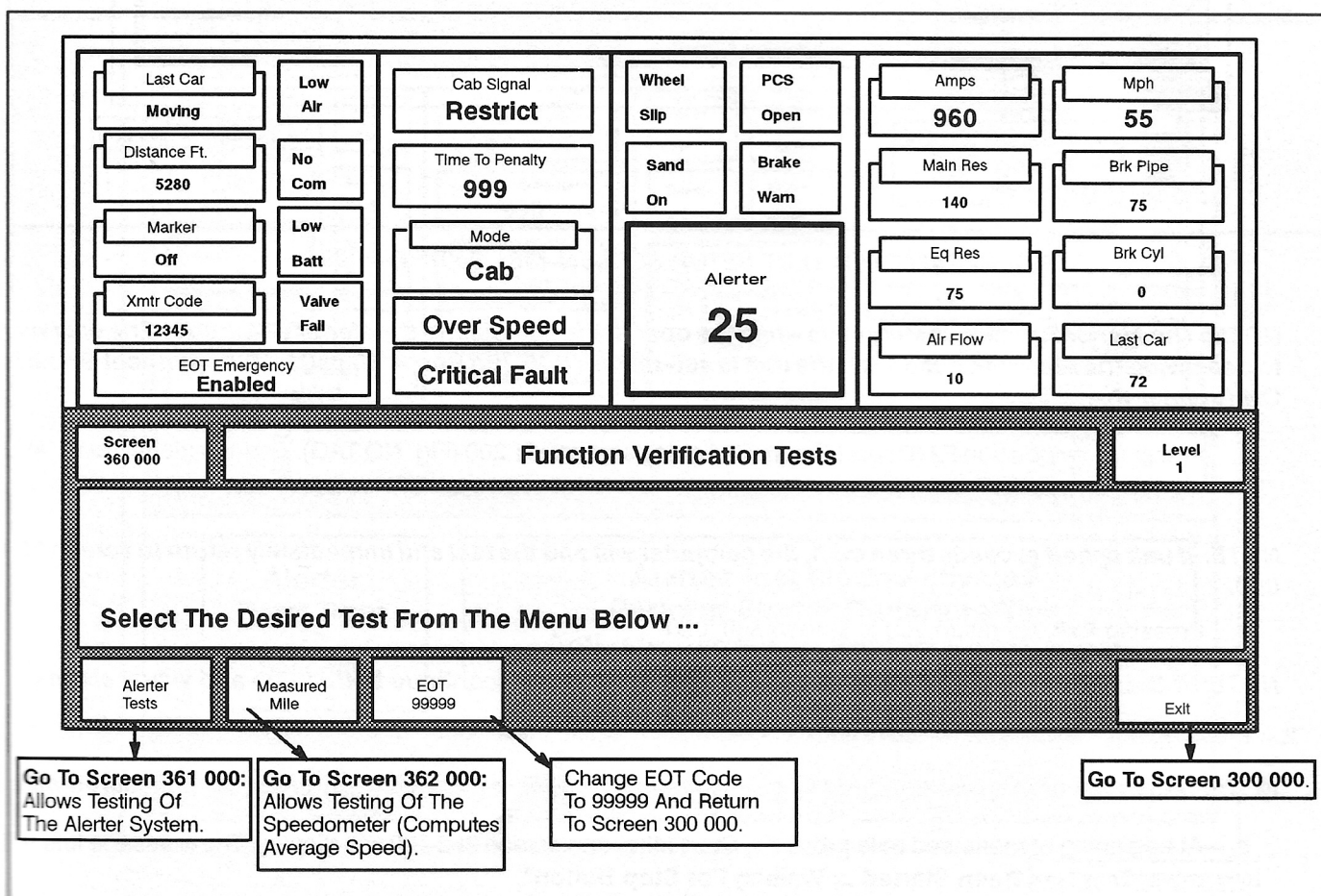


FIG. 46. FUNCTION VERIFICATION TEST SCREEN (360 000). E-40983.

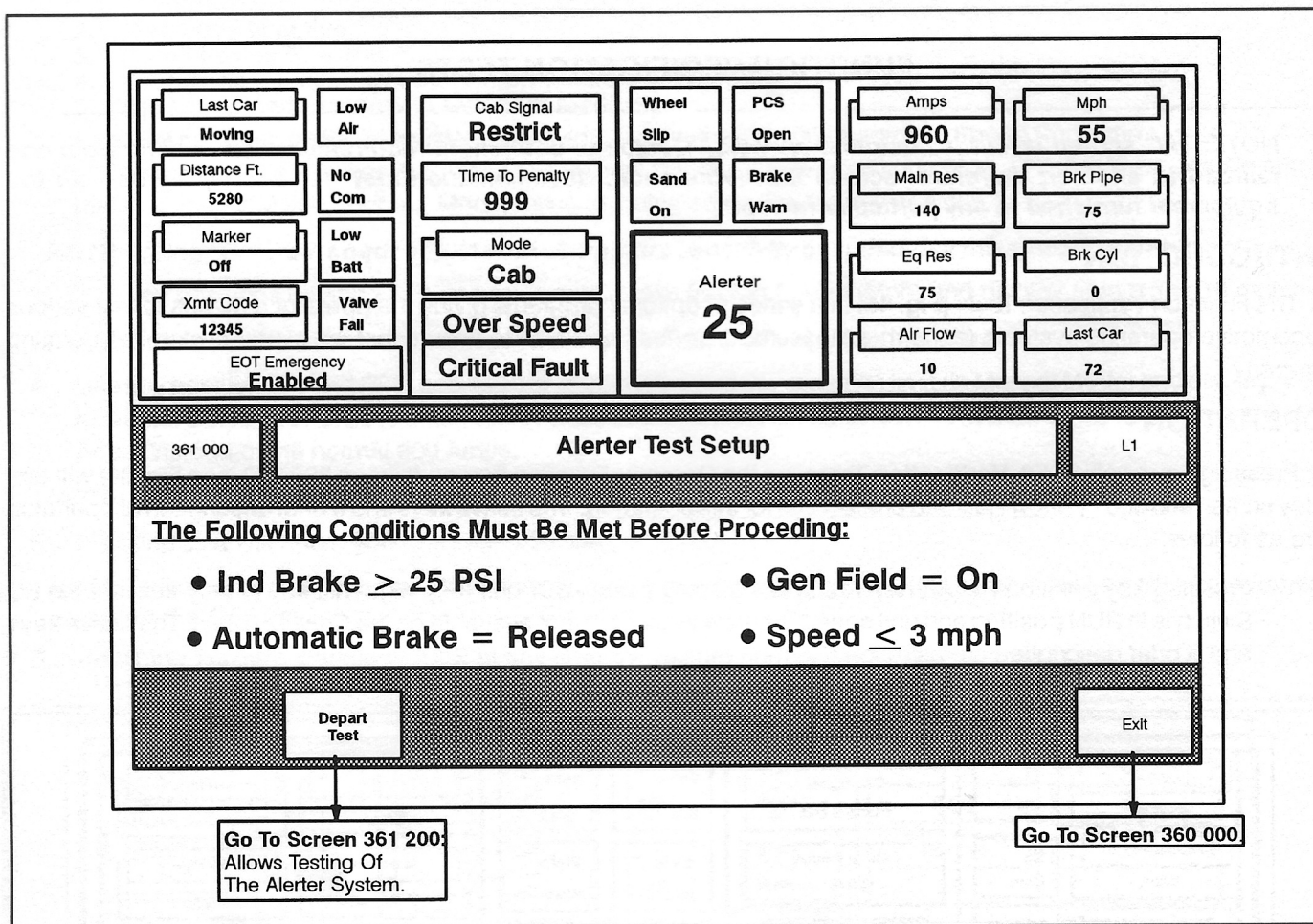


FIG. 47. ALERTER TEST SETUP SCREEN (361 000). E-40984.

**NOTE:** The Alerter Function is still active while the operator is completing the alerter test mode. The only way to deactivate the Alerter Function is if the unit is set-up for TRAIL (Eq Res < 10 psi) or Independent Brake is ON (greater than 25 psi).

- Pressing key position F2 (**Depart Test**) will display screen 361 200 (Fig. NO TAG). Perform alerter reset (AVB will beep twice) before timer counts to zero.

**NOTE:** If unit speed exceeds three mph, the computer will end the test and immediately return to screen 360 000.

- Pressing **Exit** will return you to screen 360 000.

**NOTE:** If the Alerter applies a penalty brake, the AVB box will discontinue both audio and visual alarms.

- Pressing key position F2 (**Measured Mile**) will display screen 362 000 (Fig. 49).

**NOTE:** Accuracy of this test depends upon maintaining a constant speed throughout the measured mile.

- At beginning of measured mile press F1, **Start Mile**, and screen 362 100 will display. The message line will read "Test Has Been Started ... Waiting For Stop Button".
- Two keys are active on this screen. Upon the end of the measured mile, press F2 (**Stop Mile**). The computer will stop the test and screen 362 120 will be displayed.

- c. The message line will read **"Average Speed For The Mile Was XXX.X"**. Two keys are active on this screen. If operator would like to repeat this test, press F1 (**Repeat Test**). If operator is satisfied with test results, press F8 (**Exit**) and screen 360 000 will be displayed.
3. Pressing key position F3 (**EOT 99999**) will change the EOT transmitter code to 99999 and return to screen 300 000.
4. Pressing **Exit** will return you to screen 300 000.

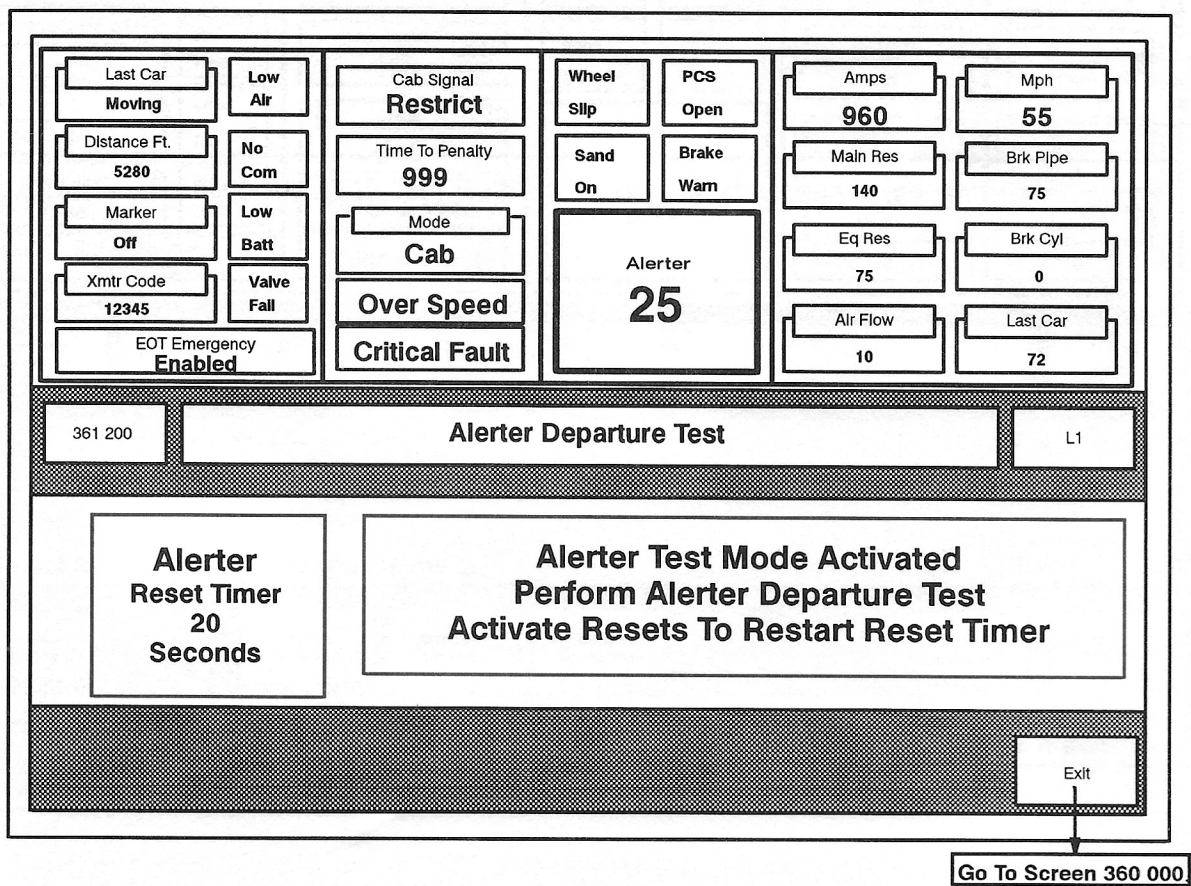


FIG. 48. ALERTER DEPARTURE TEST SCREEN (361 200). E-40985.



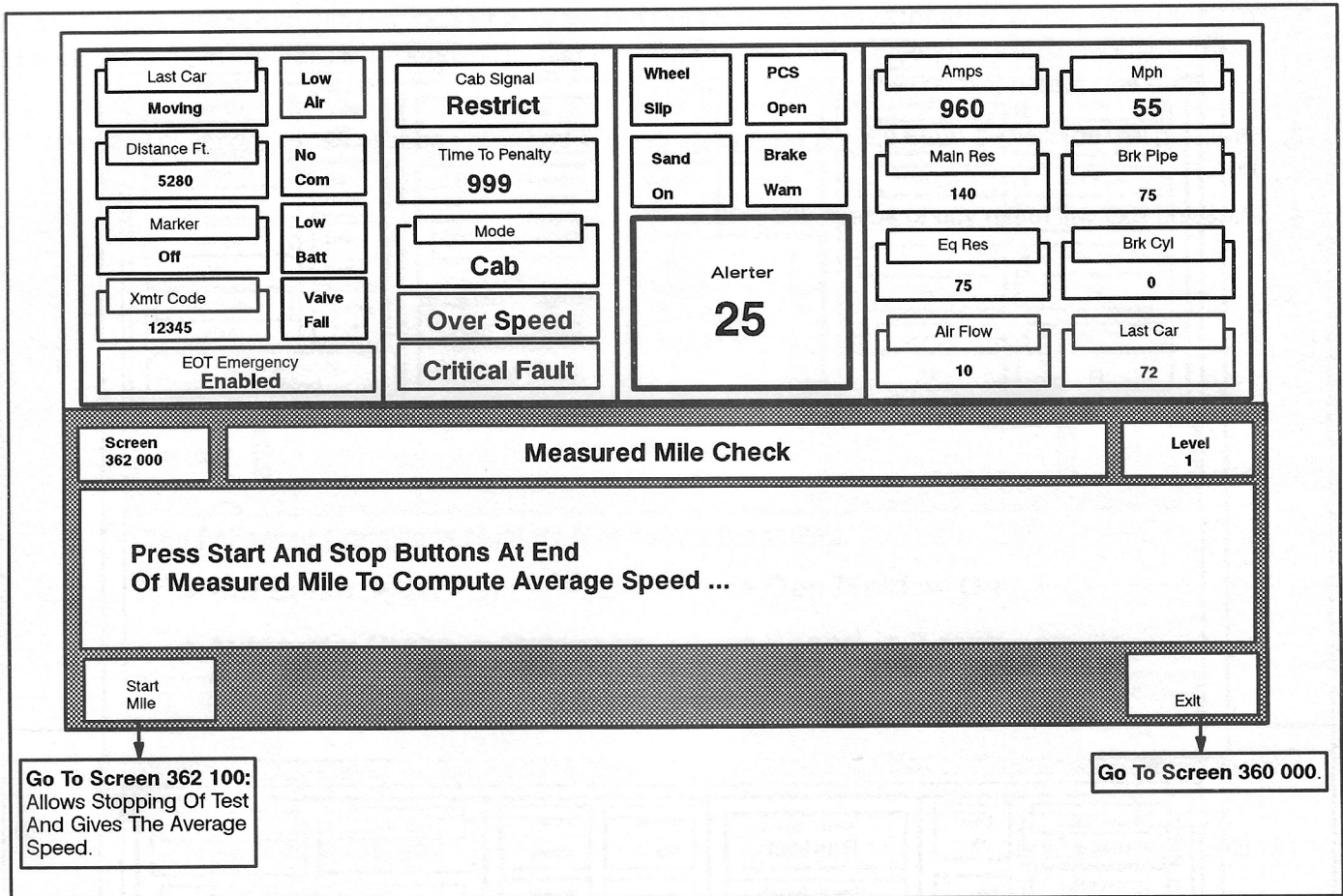


FIG. 49. MEASURED MILE TEST SCREEN (362 000). E-40986.

## FUNCTION SCREEN MENU

**NOTE:** IFD screen layout is customer specific. Customer equipment requirements often differ from one railroad to another; therefore, screen illustrations and documentation may not entirely agree with the equipment furnished to any particular railroad.

### INTRODUCTION

Screen Menu (Fig. 50) is a program which gives the operator the ability to change IFD screen properties such as color and brightness.

### OPERATION

Pressing key position F7, **Screen Menu**, on the Operator Function Screen (screen 300 000, see Fig. 39) will display screen 370 000. The active keys and a brief description of operation are as follows:

1. Pressing key position F1 (**Test Screen**) will display a colored block for three seconds and then return to screen 370 000.

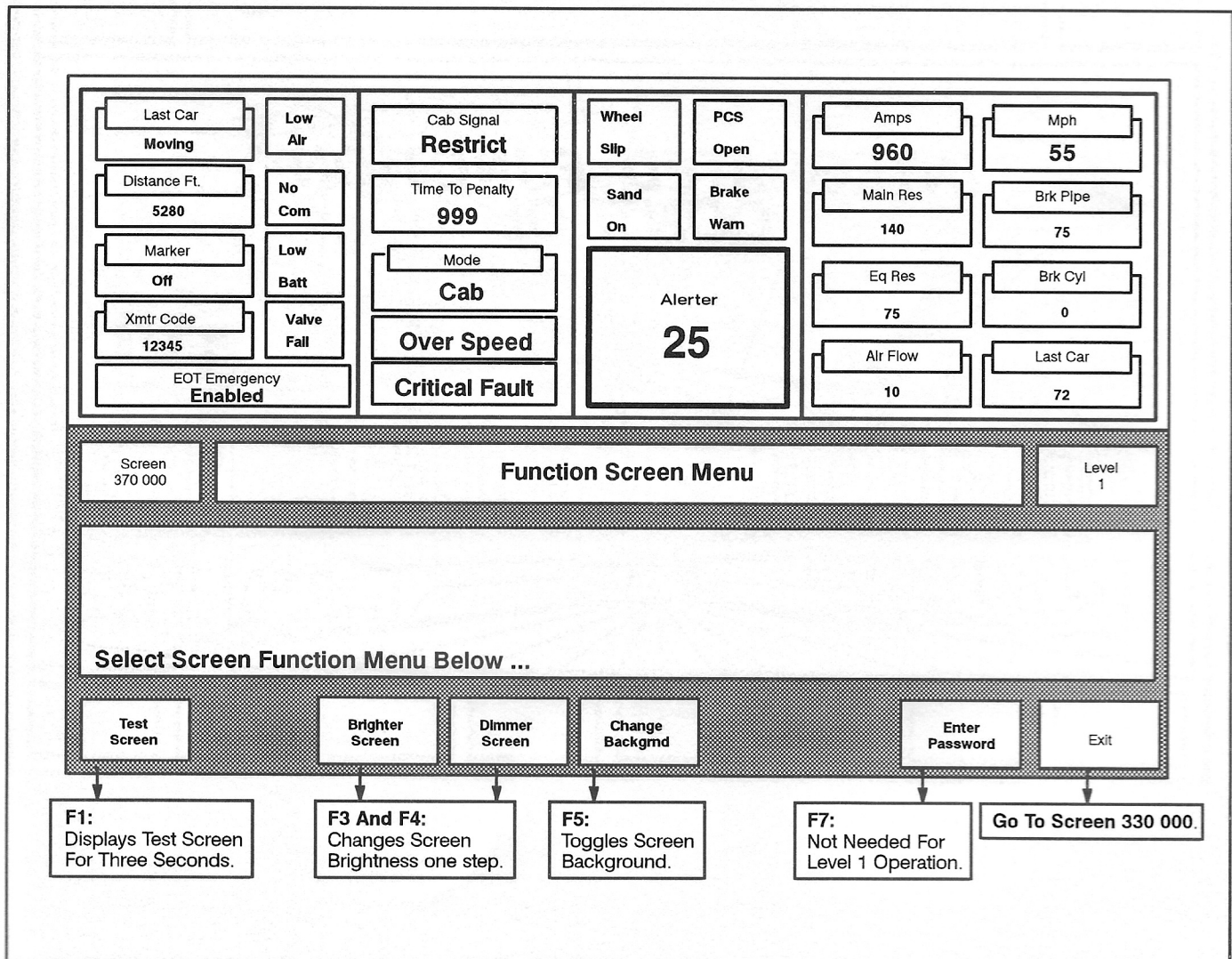


FIG. 50. FUNCTION MENU SCREEN (370 000). E-40987.

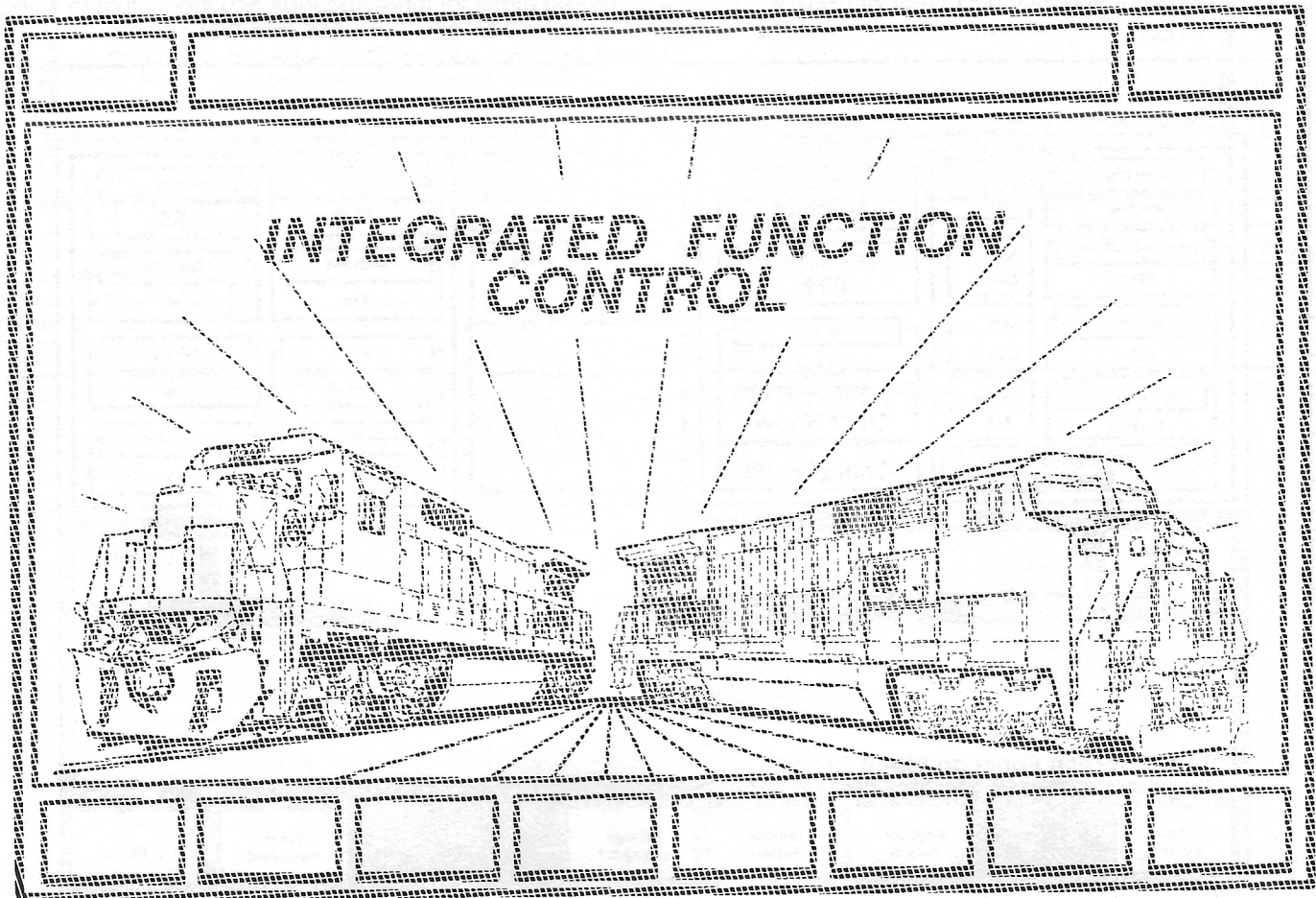
- Pressing key position F3 (**Brighter Screen**) will increase the screen brightness one step.

**NOTE:** Using this key to bring the screen to full brightness will disable the automatic brightness function.

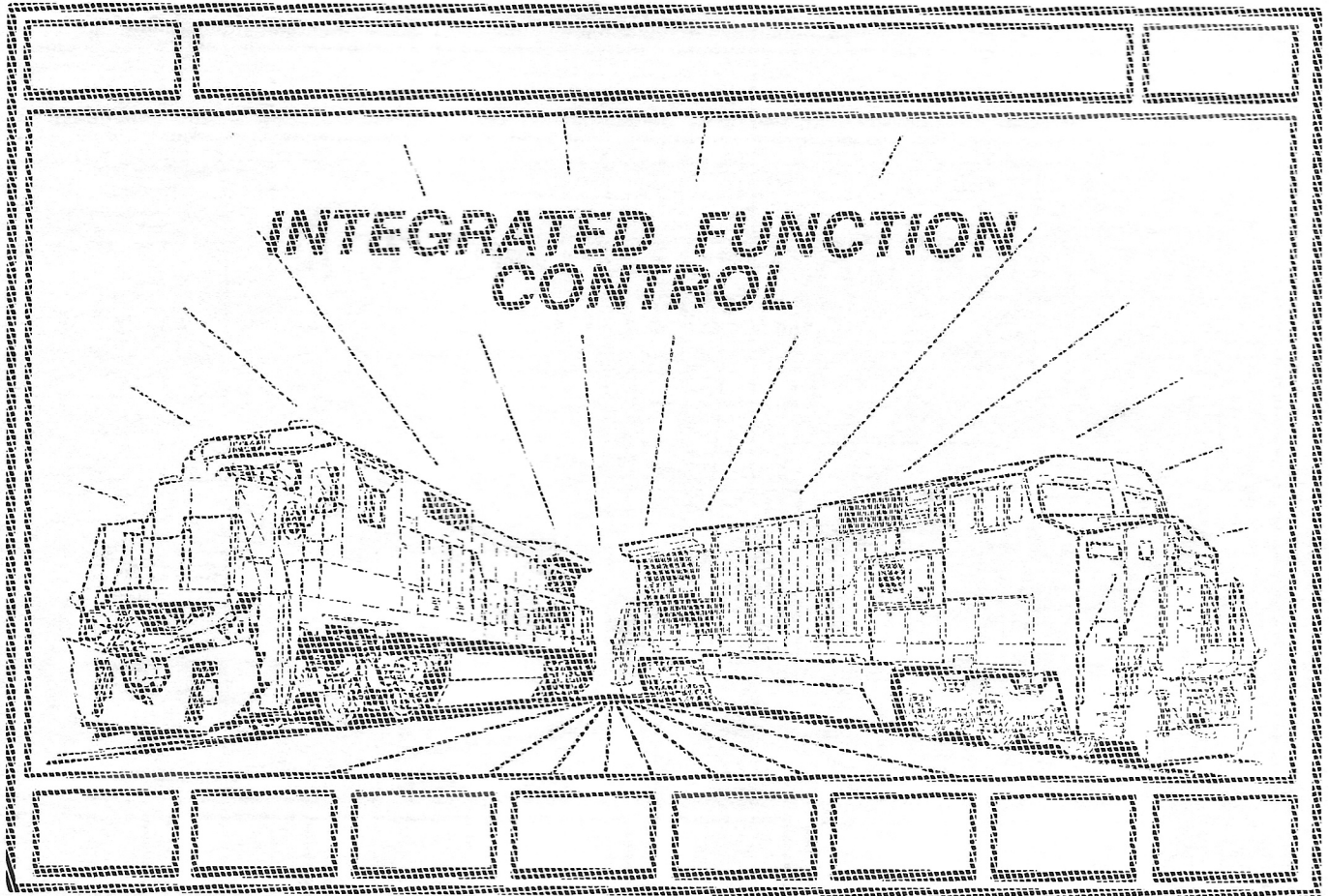
- Pressing key position F4 (**Dimmer Screen**) will decrease the screen brightness one step.

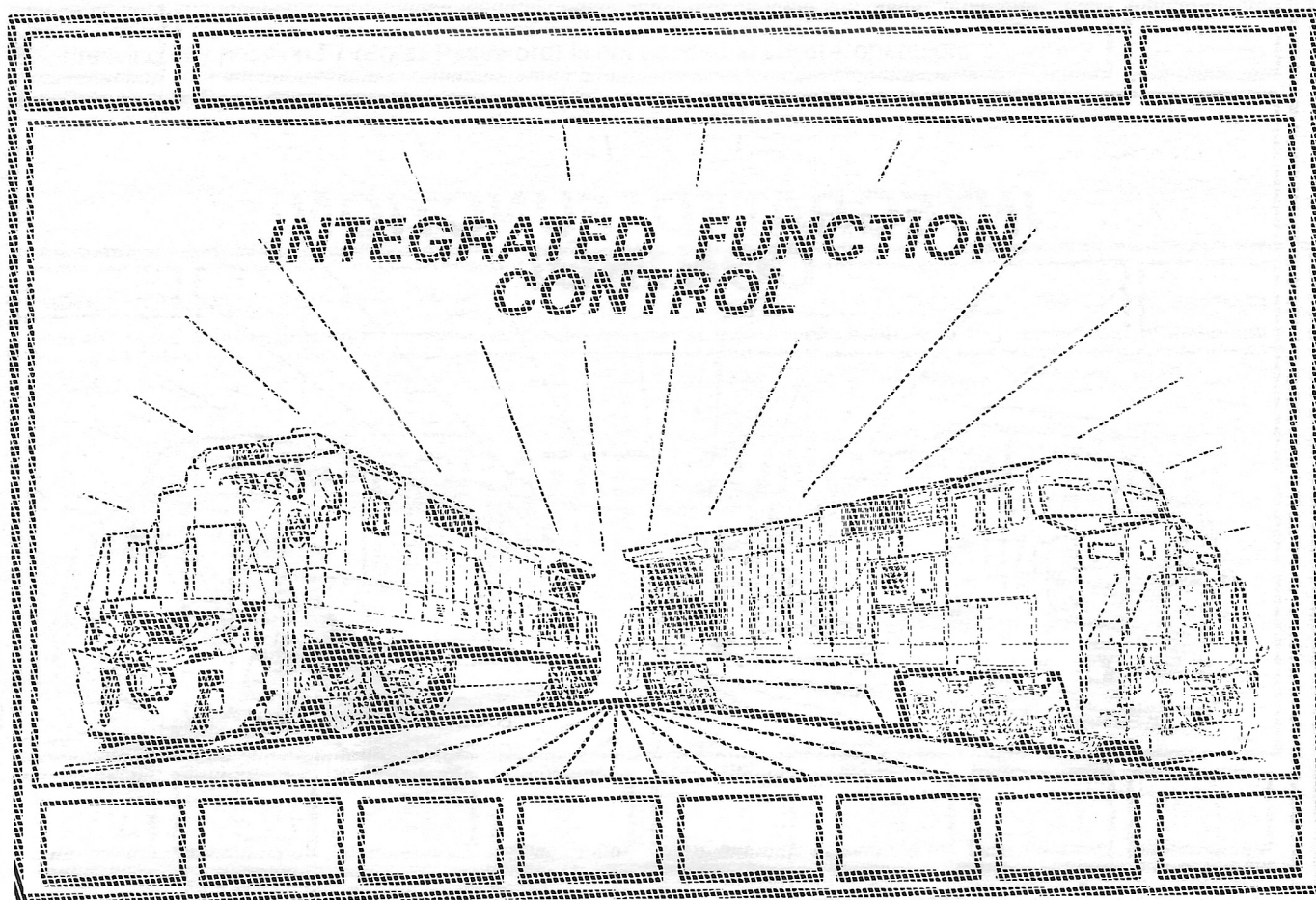
**NOTE:** Pressing and holding the Alarm Silence Button for five seconds will restore the screen to full brilliance.

- Pressing key position F5 (**Change Backgrnd**) will toggle the background color (from black on white to cyan on white).
- Pressing key position F7 (**Enter Password**) is not needed in Level 1 operation.
- Pressing **Exit** will return you to screen 300 000.

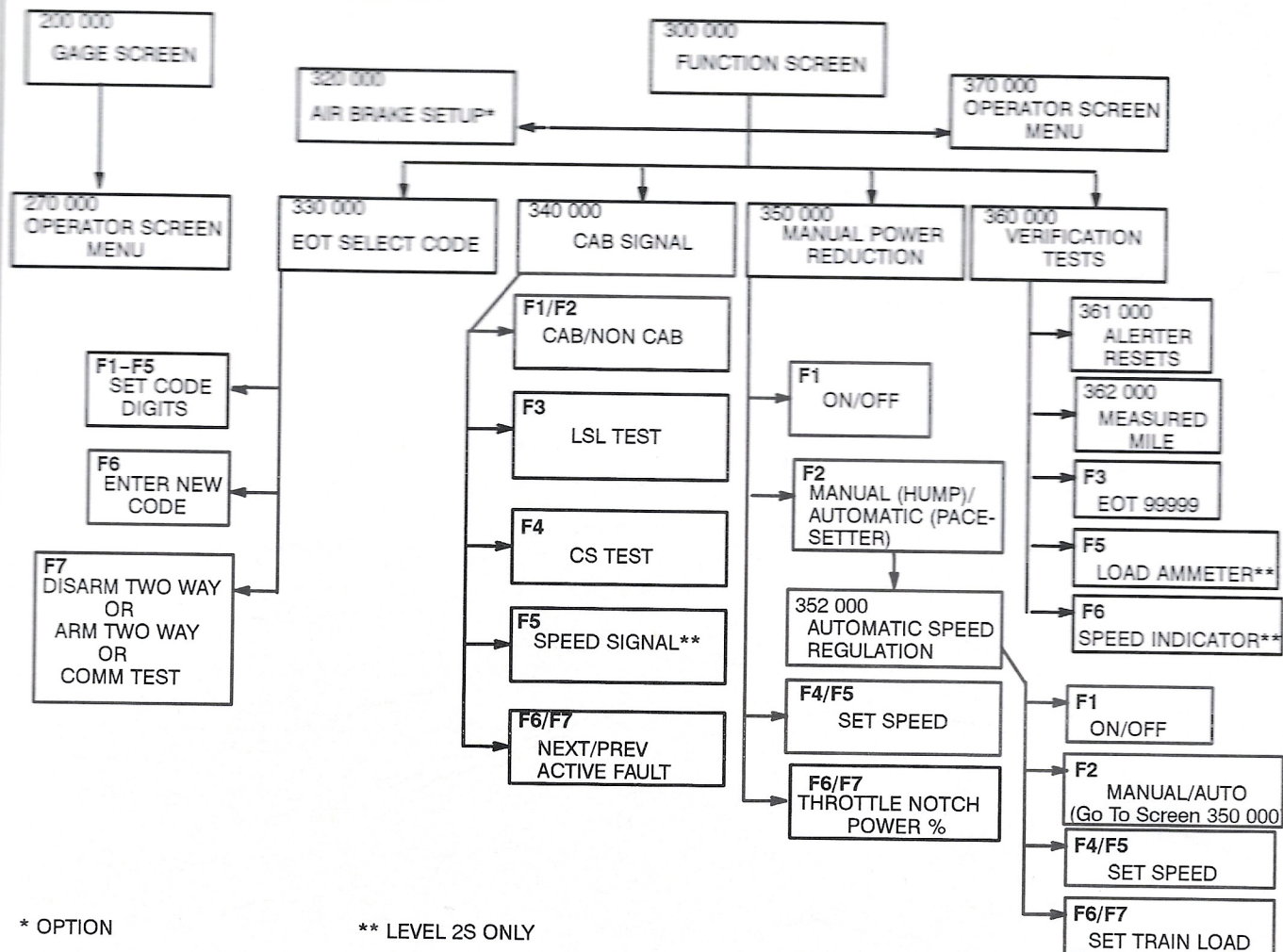








# IFD SCREEN FLOW CHART



\* OPTION

\*\* LEVEL 2S ONLY

## IFD SCREEN TREE

### SCREEN NUMBER

000 000  
100 000  
200 000  
270 000  
271 000  
277 000  
300 000  
320 000  
321 000  
330 000  
340 000  
343 000  
344 000  
350 000  
352 000  
360 000  
361 000  
362 000  
365 000  
366 000  
370 000  
371 000  
377 000  
500 000  
700 000  
710 000  
770 000  
800 000

### SCREEN DESCRIPTION

TOP LEVEL DISPLAY  
LOCOMOTIVE MONITOR\*\*  
OPERATOR GAGE DISPLAY  
Operator Screen Adjust  
Test Screen  
Enter Password  
OPERATOR FUNCTION MENU  
Air Brake Setup - Current Values\*  
Air Brake Setup - Change Values\*  
End Of Train (EOT) - Select Code  
Cab Signal - Menu  
Cab Signal - LSL Test  
Cab Signal - CS Test  
Power Reduction - Manual  
Automatic Speed Regulation  
Function Verification Test Menu  
Alerter Tests  
Measured Mile Check  
Load Ammeter Test\*\*  
Speed Indicator Test\*\*  
Function Screen Menu  
Test Screen  
Enter Password  
SELECT RAILROAD\*\*\*  
SCREEN MENU  
Test Screen  
Enter Password  
SYSTEM TEST MENU\*\*\*

\* Not Available Yet \*\* For Level 2 Operation Only \*\*\*Requires Level 2S Permission or Higher





## ***GE Transportation Systems***

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